

# BANISTERIA

A JOURNAL DEVOTED TO THE NATURAL HISTORY OF VIRGINIA



## *Problema bulenta* (Boisduval & LeConte)

The status of the two known Virginia populations of this rare inhabitant of tidal marshes is discussed on pages 20-22 of this issue

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ISSN 1066-0712

Published by the Virginia Natural History Society

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*Cover:* Rare skipper (*Problemata bulenta*) on swamp milkweed (*Asclepias incarnata*); photo by Anne C. Chazal.  
*Inside back cover:* Original drawing by John Banister; provided by Joseph and Nesta Ewan.

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Number 19, 2002

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## Home Range and Movement of the Allegheny Woodrat (*Neotoma magister*) in Virginia

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### INTRODUCTION

The Allegheny woodrat (*Neotoma magister*) meets the criteria of “species of special concern” in Virginia as defined in Terwilliger (1991). The woodrat has been extirpated from New York and Connecticut, is endangered in New Jersey and Ohio, and is listed as threatened in Pennsylvania (Handley, 1991:550). Woodrat populations are generally considered to be stable in West Virginia and Maryland (Balcom & Yahner, 1996), but are declining in Virginia (Mengak, 2000). Reasons for the loss of some woodrat populations and decline in others are unknown. Numerous investigators have proposed several explanations, including habitat fragmentation, predation, defoliation of oaks (*Quercus* spp.) by gypsy moth (*Lymantria dispar*), transmission of a parasite from raccoons (*Procyon lotor*), forest management including clearcutting, human disturbance, climate change, and food shortage possibly due to increased mast utilization by white-tailed deer (*Odocoileus virginianus*) and black bear (*Ursus americanus*) (Handley, 1991; McGowen et al., 1994; Balcom & Yahner, 1996).

Little information is currently available on the home range or movements of woodrats in the Ridge and Valley Province of the southern Appalachian Mountains. This paper reports the results of a short-term study of woodrat home range using radiotelemetry. Movement data based on the capture and recapture of marked individuals are also presented.

### STUDY AREAS

The results presented here are from two sources.

The first is radiotelemetry data collected from collared woodrats. The study site was located approximately 11 km north of Callaway, Franklin County, Virginia on State Route 744. The Callaway site is atypical for woodrat habitat. Typical woodrat habitat consists of caves, cliffs, boulder fields, talus slopes and rock outcrops. The second source is from trapping data collected over 11 years from two sites in Giles and Bath counties, Virginia.

The Callaway site (37°06'N, 80°02'W) was privately owned and consisted of numerous anthropogenic structures including, a house foundation (the house was destroyed by fire several years prior to this study), an abandoned sawmill with several sawdust and sawed board piles, two abandoned vehicles, and two sheds. The area encompassed approximately 2 ha. The center of the study area was an old field that had not been grazed or mowed for approximately 4 years. Vegetation in the field was typical for this area – blackberry (*Rubus* spp.), honeysuckle (*Lonicera japonica*), pokeberry (*Phytolaca americana*), grasses and numerous annual and perennial species. Along the edge of the field, vegetation consisted of red and white oaks (*Quercus* spp.), pine (*Pinus* spp.), maple (*Acer* spp.), hickory (*Carya* spp.), cherry (*Prunus* spp.), beech (*Fagus* spp.) and other species with oaks and pines most abundant. The area was bordered on the east by a county maintained dirt road, on the south by a pasture grazed by dairy cattle, on the west by forest and a small first-order stream and on the north by forest. Several occupied houses and barns were within 1.0 km of the site. The sawmill had been abandoned for over 3 years. Elevation was 400 m.

The Giles County site (37°22'N, 80°37'W) was located approximately 15 km west of Mountain Lake. Elevation was 1300 m with a western exposure. The site consisted of a long cliff and talus field extending for over 800 m in a north-south direction. Tree vegetation varied from mountain ash (*Sorbus*

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*americana*), black birch (*Betula lenta*) and mountain maple (*Acer pennsylvanicum*) along the northern end to northern red oak (*Quercus rubra*), hickory, and sourwood (*Oxydendrum arboreum*) along the southern end. Understory vegetation included blueberry (*Vaccinium* spp.), mountain laurel (*Kalmia latifolia*), greenbrier (*Smilax* spp.), moss, and ferns and seedlings of the dominant trees.

The Bath County site (38°10'N, 79°45'W) was located along an unnamed ephemeral tributary of the Jackson River approximately 30 km north of Warm Springs, Virginia. The site was a deep cove with an eastern exposure. The cove was ringed with cliffs and caves along the top edge of the ridge. Tree vegetation consisted of white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), basswood (*Tilia americana*), shagbark hickory (*Carya ovata*), northern red oak, and white oak (*Q. alba*). Understory vegetation included greenbrier, tree seedlings, mountain laurel, and numerous perennial herbs. Elevation was 680 m.

#### MATERIALS AND METHODS

At all three sites, woodrats were live captured using single-door, collapsible Tomahawk traps (No. 201) baited with apples. Captured animals were ear-tagged using No. 1 Monel sequentially numbered ear tags. Captured animals were weighed, sexed, examined for general body and reproductive condition, aged based on weight and pelage condition, and released at the capture site. Trapping occurred at numerous intervals throughout the year but the exact frequency varied due to weather conditions and other factors. Both the Giles and Bath county sites have been trapped at least 25 times between 1990 and 2000. Traps were placed at permanently numbered stations. Stations were located on a base map of each area and both station number and animal number were recorded at each capture. The Callaway site was trapped regularly from 1991 to 1993, sometimes at 2-week intervals but generally once per month.

##### Telemetry

Animals at the Callaway sites were fitted with radio collars placed around the neck and secured with a wire collar (A. C. Hicks, New York Department of Environmental Conservation, pers. comm.). The antenna trailed behind the animal. Hollow Hill Systems, Ontario, Canada, manufactured the radio collars. Collars weighed approximately 15 g, radio frequency was 150 MHz, battery life was estimated at 4-5 months, and range was estimated at 250-300 m (estimates provided by manufacturer). Tracking occurred from

January through May 1993. Tracking took place from 0.5 h before sunset to midnight at least twice per week.

Animals were located by determining the direction from the observer to the animal along the line of the strongest audible radio signal. Compass bearings were taken from the telemetry station to the animal. Telemetry stations were established along the county road and at several locations within the field. Stations were surveyed with a tape and compass and located on a map of the area that included dominant landmarks, the road, buildings, a power line and intersections of the road with the power line, stream and driveways.

Telemetry readings were taken once per hour and at least three readings were taken on each animal per night. Time between readings on an individual could be kept to 8 minutes or less because the area was small. An attempt was made to locate each animal every hour. Since I was able to get relatively close to where the animals were located (generally within 30 m), I assumed signal bounce was not a factor and therefore no corrections were made to the compass readings. Readings were plotted on a map of the study area. Locations were accepted if they formed a triangle and if each leg of the triangle was 5 m or less in length. The animal was then assumed to be at the center of that triangle. A point, representing the animal's location was placed on the map and the points were connected using the Minimum Area Method to determine the home range. A dot grid was used to determine the area of the home range for each animal. Home ranges were determined by month and a home range was calculated based on all readings taken on an animal during each month. Monthly home ranges were determined only if there were a minimum of five acceptable readings for an animal during the month.

##### Trapping

Repeated captures of tagged individuals were used to determine home ranges at the sites in Giles and Bath counties sites. Only animals caught at a minimum of three different trap stations and a minimum of 60 days between first and last capture were used in this analysis. Home range was determined by plotting all capture locations on a map of the study area. The outermost trap stations were connected using the Minimum Area Method. A dot grid was used to compute home range size. I also computed a linear measure of movement. I defined furthest distance moved between locations as the distance between the two furthest trap stations where an animal was caught. This was determined by measuring, on a map of the study area, the straight-line distance between the most distant stations where the animal was caught. This measure gives insight into

short-term movements of woodrats, presumably while foraging or seeking mates.

Neither capture records nor telemetry data give a complete accounting of the area used by woodrat. However, both methods provide a minimum estimate of home range size. Since I did not quantify habitat features, no inferences are made regarding habitat use versus availability.

All animals used in the analysis are independent of each other. Mean home range size was compared between months and between males and females using a Student's *t*-test. Statistical significance was set at  $\alpha < 0.05$  unless otherwise noted.

## RESULTS

### Telemetry

From 12 January 1993 to 30 April 1993, five woodrats (4 females, 1 male) were equipped with radio transmitters. Two animals were monitored in January, five in February and March, and three in April and May. Woodrats at the Calloway sawmill site moved very little on cold January nights, preferring to remain in their shed or woodpile. Individuals had very small home ranges. The individual monthly home range varied from 0.003 ha to 0.041 ha. Over four months, the individual composite home range varied from 0.021 ha to 0.105 ha (Table 1). Average home range size for the four females during the study was 0.179 ha (SE = 0.003 ha).

Movements increased in February perhaps in relation to the onset of the breeding season. Radio number 131 was a male who lived most of the winter in

the sawmill and had a home range overlapping three females (No. 150, No. 89 and ear tag 207). Not surprising, he had the largest home range in both March and April and the largest composite home range. He was radio-tracked beginning in February and was visually observed (in February) mating with a radio-collared female over 125 m from the sawmill that was in his normal home range. His last known location was a burned house foundation 15 m from the shed housing female number 70. On 21 May 1993, traps were set at the location of the strongest radio signal but he was not captured and his fate is unknown.

One adult female (No. 110) was tracked from January to March. Near the end of March, I obtained radiolocations indicating that she moved 150-175 m north along a small stream. Subsequent tracking lead me to believe she was not moving. A ground search located her remains (a tooth, fur, partial tail and radio collar). Presumably she was killed and eaten by a predator (owl, fox and feral cats are known to inhabit the area).

Radio number 150 was a small female (250 g) who lived all winter near the sawmill under 2-3 woodpiles. Her composite home range was the second largest among the four females (Table 1). She remained near the woodpiles until April when the landowner used a bulldozer to move the woodpiles. Female 150 temporarily moved to a woodpile 30 m away and just inside the woodlot that had been selectively logged in March 1993. Her last radio location was taken in late May and she had moved at least 0.7 km away, crossing three small streams and steep hills. Traps were set near where the radio signal was located but she was never captured. Her fate was unknown.

Table 1. Calculated monthly home range (hectares) and number of plotted locations (in parenthesis) of five radio-collared adult Allegheny woodrats in Franklin County, Virginia, 1993.

Month	Animal Number				
	70(♀)	89(♀)	110(♀)	150(♀)	131(♂)
January	0.005 ( 9)	--- <sup>1</sup>	0.009 (10)	--- <sup>1</sup>	--- <sup>1</sup>
February	0.032 (17)	0.045 (14)	0.015 ( 7)	0.033 (12)	0.015 (12)
March	0.013 (18)	0.021 (15)	0.003 (12)	0.015 (18)	0.044 (17)
April	0.003 (10)	0.028 <sup>2</sup> ( 9)	--- <sup>3</sup>	0.011 ( 8)	0.041 ( 7)
Composite HR	0.037 (34)	0.069 (29)	0.021 (17)	0.054 (30)	0.105 (29)

<sup>1</sup> Not collared until late January or early February.

<sup>2</sup> Lost her collar in early April.

<sup>3</sup> Found dead in March.

Three animals remained in May 1993 (radio numbers 70, 131 and 150) and tracked to determine a final location before tracking ended and the batteries expired. Animal 70 had not appeared to move from under a shed for 3-4 weeks in late-April and early-May and was presumed to have died. A large ear-tagged male (410 g, tag 222/238) was caught five times in the shed where female 70 lived all winter.

#### Trapping – Giles County

Ten individuals were caught at least three times but at only two stations and could not be included in the home range analysis. Nineteen individuals were caught at least three times and at a minimum of three stations over the 11-year study. Ten were females and nine were males. The age (at first capture) distribution was: females-5 adults, 2 juveniles, and 3 subadults; males – 8 adults and 1 juvenile. All age categories were combined within gender for the analysis.

Mean number of captures was 9.1 and 6.2 times for females and males, respectively (Table 2). The longest distance moved between any two trap stations was by a female (No. 334) and covered a distance of 340 m. This movement occurred between two capture events only 66 days apart. In contrast, another adult female was trapped 11 times over nearly four years (Mengak 1997). Her greatest linear movement between any two captures was only 50 m but the captures were 457 days apart (8 July 1994 and 15 October 1995). The longest distance between any two captures was 340 m and 310 m for females and males, respectively.

Average distance between the furthest two capture locations was 169.7 m (SD = 108.3 m) and 190.6 m (SD = 92.3 m) for females and males, respectively. The difference was not significant ( $t = -0.440$ ,  $df = 17$ ,  $P < 0.05$ ).

Home range size based on trapping observations was 0.189 ha (SD = 0.136 ha) for females and 0.234 ha (SE = 0.202 ha) for males. The difference was not statistically different ( $t = -0.546$ ,  $df = 12$ ,  $P < 0.05$ ).

#### Trapping – Bath County

Thirteen individuals were caught three or more times but only at two trap stations and were excluded from further analysis. Nineteen individuals were used in the analysis – 14 females and 5 males. The age distribution (at first capture) for females was: 6 adults, 5 juveniles, and 3 subadults. The age distribution for males was 1 adult, 2 juveniles, and 2 subadults. Once again, all age categories were combined for analysis.

The longest distance between any two captures was 245 m and 180 m for females and males, respectively. The average distance between the furthest two capture locations was 102.1 m (SD = 68.8 m) and 104.0 m (SD = 68.1 m) for females and males, respectively. The difference was not significant ( $t = 0.012$ ,  $df = 16$ ,  $P < 0.01$ ).

Home range size based on trapping observations was 0.068 ha (SD = 0.084 ha) for females and 0.063 ha (SE = 0.049 ha) for males. The difference was not statistically different ( $t = 0.134$ ,  $df = 16$ ,  $P < 0.05$ ).

### DISCUSSION

Telemetry and trapping provided insights into the behavior of individual woodrats. At the Callaway site, the relationship between female 110 (collared) and female 209 (uncollared) is particularly interesting. Female 209 inhabited an abandoned car and shed in March/April 1992. Her last capture was on 23 April 1992. Female 110 was first caught near the abandoned car in September 1992 and repeatedly caught in the car

Table 2. Summary of measures (mean and standard deviation) used to assess movement of Allegheny woodrats in Virginia based on capture and recapture records, 1990-2000.

	Number of Individuals	Mean Number of Captures	Mean Home Range (ha)	Longest distance moved between any 2 captures (m)	Days between first and last capture
<u>Giles County</u>					
Females	10	9.1 (2.6)	0.189 (0.136)	169.7 (108.3)	596.6 (285.6)
Males	9	6.2 (3.2)	0.234 (0.202)	190.6 (92.3)	512.1 (383.9)
<u>Bath County</u>					
Females	14	10.4 (5.1)	0.068 (0.085)	102.2 (68.8)	429.5 (283.6)
Males	5	8.5 (4.1)	0.063 (0.049)	104.0 (68.1)	312.8 (199.1)



and shed through March 1993. Upon the death of animal 110 in late March, female 209 was again caught in the shed within 10 days of telemetry indicating that No. 110 had moved upslope along the stream to the site where she was found dead. It is assumed that 110 displaced 209 and occupied the area until her death. Woodrat 209 probably existed in the woods and brush piles near the car and shed but was never captured again until 110 was removed from the area. This raises questions concerning the apparent disappearance from the trappable population of other woodrats and leads me to suspect that displaced animals may exist on the fringe of the trap area.

Both eastern (*N. floridana*) and Allegheny woodrats are known to cache food items in autumn for overwinter use (Poole, 1940; Fitch & Rainey, 1956). Large food caches were obvious in several of the buildings known to house radio-collared individuals. Cached food items comprise the primary food supply during winter (Castleberry, 2000a) but limited foraging occurs presumably during periods of favorable weather. Caching allows access to food throughout the winter with minimal exposure to harsh weather or predators. The availability of cached foods helps explain the small home range size as determined by telemetry at the Callaway site.

Movements based on trapping records showed little pattern. Some animals made long movements, others moved very little. Sometimes the maximum movement occurred over a relatively short time interval. At other times, the animal was caught several times over many months but always at about the same trap station. Of course, there is no way to know the movements of the animals between trapping events. The data presented here suggest that, over time, most woodrats move relatively little. They may move larger distances but they seem to return to a "central" location where they are most often trapped.

Although males seem more likely to move longer distances over the total number of capture events, there is very little difference between males and females when considering distance moved between any two consecutive dates. This could mean that both males and females make considerable exploratory movements for feeding or breeding but males may travel further than females. This observation may receive support from the home range data on radio-collared woodrats, but only one male was radio tracked so the data are clearly incomplete at this time.

Zuck (Department of Forestry, West Virginia University, pers. comm.) used radio telemetry to assess juvenile dispersal of woodrats in West Virginia. During 1999-2000, they did not observe any juvenile dispersal. However, an ear-tagged male was recaptured

approximately 2 km from his original capture site and other individuals were reported to have made movements > 400 m for their original capture location (range 500-2500 m). Castleberry et al. (2001) estimated spring and summer home range size of 34 radio-collared Allegheny woodrats as 6.5 ha and 2.2 ha for males and females, respectively. Castleberry et al. (2001) studied movements in relation to timber management and found that home range varied within timber harvest treatment from 1998 to 1999. For example, in clearcut areas, home range was 6.0 ha and 2.2 ha for all individuals in 1998 and 1999, respectively. Other treatments showed similar differences between the two years. Maximum nightly distance moved from the den during foraging forays ranged from 134.5 m to 186.4 m. These distances are similar to the trapping results in my study.

Castleberry et al. (2001) pointed out that their home range results are larger than any reported for most other *Neotoma* species. They suggested that home ranges are generally larger in spring and summer when the animals are actively foraging and seeking mates. Mengak (2002) found that most woodrat reproduction occurs in March-May in Virginia. Castleberry (2000b) failed to detect any influence of moon phase or illumination on the activity patterns of woodrats in his study. Castleberry et al. (2001) found that woodrats used forest and clearcut areas in proportion to their availability.

In my study, the Bath County site consisted of intact forest but the Giles County site had intact forest, open talus with no overstory and edge habitat along a field border. The juxtaposition of various habitat types (including the old field at the Callaway site) does not seem to negatively affect patterns of woodrat movements. Woodrats were caught in traps in the old field and in the open talus field, as well as under the forest canopy. Timber type, harvest activity, or edges do not seem to inhibit woodrat movements nor exclude woodrats from an area. Other environmental factors, such as food supply and competition, predation or disease, may have a greater impact on woodrat distribution, habitat occupancy, and colony persistence than human activity.

In conclusion, Allegheny woodrats in this study have small winter home ranges as determined by telemetry. Trapping results, though providing a small sample, seem to confirm that at my study sites across multiple years, individual resident woodrats are generally caught within a small area of the larger habitat. Because of the multiple years covered by this study, no information is available on home range overlap or territorial behavior. Small home ranges and the isolated nature of suitable woodrat habitat make this

species very vulnerable to local extinctions. Issues related to recolonization of extirpated habitat and juvenile dispersal (and gene flow) remain unanswered but vital to a thorough understanding of woodrat ecology in Virginia and throughout the range.

#### ACKNOWLEDGMENTS

Fieldwork for this project was supported by the Pittman-Robertson Federal Aid to Wildlife Restoration Project-WE99R and the Virginia Department of Game and Inland Fisheries (VDGIF) Nongame Program, USFS George Washington/Jefferson National Forests (USFS GW/Jeff) and Ferrum College Life Science Division. S. Griep (USFS GW/Jeff) and R. Reynolds (VDGIF) provided funding, logistical support, and many helpful comments on this project. Funds for data analysis and manuscript preparation were provided by a summer fellowship from the Appalachian College Association. Numerous students in the Environmental Science Program at Ferrum College assisted with fieldwork throughout the study.

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## Spiders of the Family Anyphaenidae in Virginia (Arachnida: Araneida)

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Anyphaenids (which have no “common” name) are small, pallid, ground-dwelling spiders, generally widespread in distribution but infrequently collected either by hand or with pitfall traps. North American species of the family were revised about three decades ago (Platnick, 1974), so that accurate identifications can be made with some confidence. A better knowledge of the family in different parts of its range now awaits only the accretion of relevant study material.

Examination of the distribution maps in Dr. Platnick's monograph suggests that 11 species should occur in Virginia, and intensive collecting activity during the past decade by personnel of the Virginia Museum of Natural History (VMNH) and the Division of Natural Heritage, Virginia Department of Conservation and Recreation (VDNH), has secured identifiable specimens of all but one of them. The northernmost locality of the fugitive species, *Hibana velox*, is in north central North Carolina, and the spider almost certainly occurs in southside Virginia. However, the surprising discovery of *Hibana cambridgei* in Virginia opens the possibility that any or all of the several anyphaenids known only from Florida, for instance, might also be found here.

Since most of our species are known from only a few captures (the one most frequently taken is known from only 12 sites), it will obviously be a long time before we can claim an even superficial knowledge of temporal and spatial distributions of these little spiders in Virginia. However, the data at hand suggest that several species occur statewide, and some may be restricted to the Coastal Plain. So far no species seem to be endemic to the western mountainous parts of the state, and none have been taken in the Mount Rogers-Whitetop region despite fairly prolonged trapping in a variety of habitats.

Even the limited material at hand suggests an interesting biological situation that invites more intensive investigation: the sequential - nearly exclusive - periods of surface activity by adults of the local sympatric species of *Anyphaena*. *Anyphaena celer* and *A. maculata* are Fall-Winter species, *A. fraterna* is most frequently trapped in

May and June, and *A. pectorosa* is active almost exclusively in July. Perhaps such seasonal displacement enhances reproductive isolation, or is useful in resource-sharing. The very limited data suggest that the two local species of *Wulfila* may likewise be separated temporally.

The ready availability of Platnick's monograph obviates the need for maps and illustrations. Users of this reference are reminded that many Nearctic species traditionally referred to the genus, *Aysha* have been relocated into the new genus *Hibana* (Brescovit, 1991) and the name *Wulfila alba* was replaced by *W. albens* (Platnick, 1997). Otherwise the nomenclature remains stable.

### ANNOTATED LIST

Collections not otherwise credited were made by VMNH personnel either as individuals or as part of organized sampling programs.

#### 1. *Anyphaena celer* Hentz    **New state record**

The range of this species is general over eastern United States, from Massachusetts and Michigan south to Florida, Texas, and Missouri, with the majority of recorded localities clustered toward the north. No Virginia material was available to Platnick (1974: map 1), but our records suggest the species occurs statewide.

*Clarke Co.*: Blandy Farm, ca. 3 km S Boyce, 24 August 1991, ex Malaise trap, D. R. Smith (1 ♂). *Henry Co.*: Martinsville, inside VMNH building, sticky trap, January 1995 (1 ♂). *Mecklenburg Co.*: Elm Hill WMA, DF site in mixed woods near Kerr Dam powerhouse, 15 March-3 April 1991 (1 ♂); same locality but open field DF site by Lake Gaston, 24 February-3 April 1996 (4 ♂♂). *Nelson Co.*: The Priest, 3900 ft., ca. 4.5 mi. SE Montebello, 23 November-12 December 1991, pitfall trap (1 ♂). *Pittsylvania Co.*: DF site ca. 3 miles ENE Axton, 29 February-29 March 1992 (numerous ♂♂).

Apparently this species is psychrophilic, with the collection dates falling between late August and early April. The only two series were both taken in March.

## 2. *Anyphaena fraterna* (Banks) **New state record**

This species is generally distributed over much of eastern North America: east of the Great Plains and south of glaciated regions, although unknown in peninsular Florida. It is probably statewide in Virginia at lower elevations, although most records are from east of the Blue Ridge.

VMNH samples are from: *Chesterfield Co.*: Scotford Road, 1.2 km SE jct. Va. Rt. 175 and County Rt. 679, May 1994, S. M. Roble (1 ♂). *Essex Co.*: 1 mi. S Dunnsville, ex Malaise trap, 4-14 May 1993, D. R. Smith (several ♂♂ and ♀♀). *Henrico Co.*: west Richmond, Derbyshire Road, June 1996, W. H. Mitchell (1 ♂). *Henry Co.*: Martinsville, inside VMNH building, 4 May 1994, C. R. Carter (1 ♂). *King George Co.*: Naval Weapons Laboratory, Dahlgren, 26 June 1991, K. A. Buhlmann, VDNH (1 ♂). *Roanoke Co.*: Back Creek District, Bandy Road, 9 May 1995, M. W. Donahue (1 ♂). *Stafford Co.*: Quantico Marine Corps Base, Beaver Run, N of Camp Barrett, 11 May 1999, A. C. Chazal, VDNH (1 ♂). *York Co.*: Grafton Ponds, 1 May 1990, K. A. Buhlmann, VDNH (1 ♂). *City of Virginia Beach*: Seashore State Park, 1 May 1989 (1 ♂), 26 July 1989 (1 ♀), both K. A. Buhlmann, VDNH.

Surface activity, at least by males, is almost entirely in May, with only a few June captures.

## 3. *Anyphaena maculata* (Banks) **New state record**

Published records suggest a predominantly lowland range from Long Island to Louisiana and Arkansas, with a small - perhaps disjunct - contingent in the southern Appalachians. Our two localities in eastern Virginia are consistent with this generalization.

*Chesterfield Co.*: Scotford Road, 1.2 km SE jct Va. Rt. 175 and County Rt. 679, 6 March 1994, S. M. Roble (1 ♂). *Greensville Co.*: 1 mi. E Claesville at end of Rt. 600, 12 November 1993-25 January 1994 (1 ♂).

The specimen from Chesterfield County is a little atypical in that the median apophysis of the male palpal organ is substantially broader than shown for the species in Platnick's revision (1974: Fig. 2), as well as more spatulate apically and not extended into a curved tip. In other respects there is such overall agreement that this departure is considered to be within the normal range of variation.

## 4. *Anyphaena pectorosa* L. Koch

This spider is generally distributed in eastern United States: New York to Michigan, south to Florida and Texas.

The species description in Platnick (1974: 232) is based on a specimen from Fairfax County, and *A. pectorosa* has been recorded from alfalfa fields in Montgomery County by Howell & Pienkowski (1971).

VMNH material is from: *Essex Co.*: 1.5 km SE Dunnsville, ex Malaise trap, 2 July and 12 July 1991, D. R. Smith (5 ♂♂, 2 ♀♀). *Greensville Co.*: 1 mi. E Claesville, end of Rt. 666, 30 June-15 July 1994 (1 ♂). *Mecklenburg Co.*: 2 mi. SE Boydton, 25 June 1990, J. C. Mitchell (1 ♂). *Pulaski Co.*: Dublin, fen site at Radford Army Ammunition Plant, 2 July 1999, S. M. Roble et al. VDNH (1 ♂).

Capture records, all between mid-June and mid-July, suggest a fairly narrow season of surface activity for adults of this species, contrasting with the generally much earlier season for *A. fraterna*.

## 5. *Hibana cambridgei* (Bryant) **New state record**

As depicted by Platnick (1974: map 4), this species ranges from the southern Mexican Plateau north as far as Missouri and Alabama. The discovery of *H. cambridgei* in Virginia constitutes a northeastward extension of about 550 mi/880 km from the location plotted in northern Alabama.

*King George Co.*: Naval Weapons Laboratory, Dahlgren, swale pitfall site, 26 June 1991, K. A. Buhlmann, VDNH (1 ♂).

The male palpal organ of this specimen matches Platnick's illustration (Fig. 120) to the finest detail; there can be no doubt of the identification. The spider is, however, substantially larger than the individual which he described: total length ca. 8 mm, carapace length 3.2 mm. (vs. 5.9 and 2.4 mm, respectively).

Is the Dahlgren population native to Virginia? If so, it is either naturally disjunct from the main body of the range, or simply occupies a biotope neglected during most sampling work and thus likely to be found in the intervening area. The possibility suggests itself, however, that chance introduction by "military commerce" cannot be discounted. The possibly analogous situation involving a minute lygaeid bug, *Botocudo modestus*, may be relevant. This insect was known only west of the Mississippi River prior to its recent discovery at Wallops Island, Accomack Co., Virginia (Hoffman, 1999); this locality is occupied by a quasimilitary federal installation.

*Botocudo* was not recovered in similar habitat with similar trapping techniques over a period of several months at Assateague Island, only a few kilometers distant. These uncertainties would of course be conclusively resolved by the collection of either species at a Virginia site (or elsewhere in the central Atlantic states) remote from possible contamination through commerce between military bases.

#### 6. *Hibana gracilis* (Hentz)

This spider occupies an extensive geographic range, from New York and Iowa south to Florida and southernmost Texas but records are lacking for most of the Appalachian region. It is the anyphaenid most frequently collected in Virginia, with specimens at hand from eight counties and two cities mostly east of the Blue Ridge. Platnick's range map (1974, map 4) included localities in Northampton and Fairfax counties, and Virginia Beach City.

VMNH material is from: *Chesterfield Co.*: Scotford Road, 1.2 km SE jct Va. Rt 175 and County Rt. 679, 22 April 1995, S. M. Roble (2 ♂♂). *Greensville Co.*: 2.3 mi. NE Slates Corner, 18 June 1990, J. C. Mitchell (1 ♀). *Henry Co.*: Martinsville, C. R. Carter (1 ♂). *King George Co.*: Caledon State Park, 7 June 1993, B. J. Abraham (1 ♂). *Montgomery Co.*: Radford, around dwelling, Fall 1990 (1 ♂). *Pittsylvania Co.*: Chatham, 11 March 1999 (1 ♀). *Roanoke Co.*: Salem, Green Hill Park, 20 April 1995, M. W. Donahue (1 ♀); *York Co.*: Grafton Ponds, 1 May 1990, K. A. Buhlmann, VDNH (1 ♂). *City of Chesapeake*: Fentress Naval Air Station, 6 June 1989, K. A. Buhlmann, VDNH (3 ♂♂), and *City of Virginia Beach*: Seashore State Park, 1 May 1989, K. A. Buhlmann, VDNH (1 ♂).

The great majority of these spiders were collected during March, April, and May. Two are from June, and only one has an ambiguous "Fall" date.

#### [*Hibana velox* (Becker)]

A southern species, so far not collected in Virginia but surely to be expected in the "Southside" counties being represented on Platnick's distribution map for north-central North Carolina (vicinity of Durham?), less than 35 miles from the state line.

#### 7. *Oxysoma cubanum* Banks **New verified state record**

This southern species ranges as far northward as New Jersey, and presumably occurs throughout the Coastal Plain and outer Piedmont in Virginia, although there are only two authentic records:

*Louisa Co.*: 4 mi. S Cuckoo, ex Malaise trap, 28

April-4 May 1986 (2 ♂♂); 18-27 May 1986 (1 ♂, 2 ♀♀), both D. R. Smith. *City of Virginia Beach*: Oceana Naval Air Station, 3 May 1989, K. A. Buhlmann, VDNH (1 ♂); Sandbridge, 11 September 1993, B. J. Abraham (1 ♀).

The published record for alfalfa fields at Blacksburg, Virginia (Howell & Pienkowski, 1971) seems geographically implausible, and the original material cannot be located for verification.

#### 8. *Teudis mordax* (O. P.-Cambridge) **New state record**

Already documented for North Carolina and the District of Columbia by Platnick (1974), this species could safely be assumed to reside in Virginia east of the Blue Ridge generally. However, so far we have records only for two Coastal Plain sites:

*Essex Co.*: 1.5 km SE Dunnsville, ex Malaise trap, 2 July 1991, D. R. Smith (1 ♂). *City of Suffolk*: Great Dismal Swamp National Wildlife Refuge, 30 June 1993, B. J. Abraham (1 ♀).

#### 9. *Wulfila albens* (Hentz) **New state record**

Although *W. albens* occurs from Maryland to Florida and Texas, there are apparently no published records for the species in Virginia.

We have only two specimens from the state: *Cumberland Co.*: 5.5 km SSW Columbia, DF site in pine woods, 2 September 1990 (1 ♂); 7 km SSW Columbia, DF site in mixed hardwood forest, 1 August 1990 (1 ♂) (both J. C. Mitchell). On the basis of records in nearby states, *W. albens* should be essentially statewide in Virginia, at least at lower elevations.

#### 10. *Wulfila saltabunda* (Hentz)

One of the most widely distributed of Nearctic anyphaenids, *W. saltabunda* occurs from Nova Scotia to Florida, westward to Minnesota, Iowa, and Texas. Its presence in Virginia is attested solely by a record for Virginia Beach City, plotted on Map 3 in Platnick's 1974 revision, and capture in alfalfa fields at Blacksburg, Montgomery County (Howell & Pienkowski, 1971). Presumably it should be found statewide.

*Louisa Co.*: 4 mi. S of Cuckoo, ex Malaise trap, 6-13 June 1986, D. R. Smith (2 ♂♂). *Patrick Co.*: roadside on Rte. 669, 3 mi. SW Ararat, sweeping *Ceanothus*, 27 June 1992 (1 ♂).

#### ACKNOWLEDGMENTS

The material accumulated during VDNH surveys was donated to VMNH by staff zoologists Christopher A. Pague and Steven M. Roble. Appreciation is also

expressed to Dr. Roble, and to Joseph C. and Wendy H. Mitchell, David R. Smith, Barbara J. Abraham, and Michael W. Donahue for the gift of specimens generated during their personal collecting activities.

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*Banisteria*, Number 19, 2002

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## New Records for Stink Bugs in Virginia (Heteroptera: Scutelleridae, Pentatomidae)

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Three decades have passed since publication of my survey (1971) of the pentatomoid Heteroptera in "The Insects of Virginia" series, during which time our knowledge of these insects has been substantially increased. Six species were added to the state list, and a number of recent name changes noted some years ago (Hoffman, 1994); it is now desirable to present a sequel that adds still another pentatomid to our fauna and provides significant distributional records for several others.

The occasion is taken to offer a key to the Virginia genera of the subfamily Asopinae, not recognized in my 1971 treatment, and another to our species of *Podisus* which accommodates the additional member of this genus here documented as native to the state.

Unless otherwise specified, the material mentioned herein is located in the Virginia Museum of Natural History (VMNH), which is under ongoing obligation to the staff of the Division of Natural Heritage, Virginia Department of Conservation and Recreation, for donation

- through the interest of Steven M. Roble - of valuable material obtained during its inventory activities around the state. The classification and nomenclature follows that of Froeschner (1988), except as specifically noted.

#### FAMILY SCUTELLERIDAE

##### ***Camirus porosus* (Germar)**

Although this northern member of a mostly Neotropical genus is virtually continent-wide in North America, actual capture records are rare and only a few states can claim *C. porosus* as a native resident. A collection from beach drift at Virginia Beach (Jones, 1935) provided the northernmost locality in eastern United States, and this tenuous evidence has to my knowledge never subsequently been verified. There is always some ambiguity about the origin of any beach drift finds, there being usually no way to know from what locality a specimen actually entered the water.

It is now possible to document an unequivocal Virginia locality for this very rare species: *Nottoway Co.*: Fort Pickett Military Reservation, 1.6 mi. E jct. Wilcox and Range roads, 7 July 1999, Anne C. Chazal and Amber K. Foster, VDNH survey (1). In addition to providing the new northernmost known locality for *C. porosus*, this site is of interest for its inland position on the Virginia Piedmont rather than in the Coastal Plain as might have been expected.

At first glance, *C. porosus* bears a considerable resemblance in size, shape, and coloration to species of the genus *Galgupha*, except that the integument is matte instead of shiny. A good dorsal habitus illustration was published by Froeschner (1988), but it does not indicate the coarse, dense punctation of the entire body. As seen with magnification, the bug has an unprepossessing facies with its dull black coloration, small eyes, and large, declivous head which is retracted up to the eyes in the prothorax (Figs. 1A, 1B). An interesting feature is the accommodation of the long antennae in the deep, narrow, prothoracic rostral groove from which, in the preserved specimen, they had to be extracted with a fine needle. This groove, formed by the laminate expansion of the front edge of the propleura (Fig. 1B, ppf), becomes so constricted between the procoxae that the corresponding segment of the rostrum is notably narrowed in order to fit into the narrow sinus.

I am unaware of any illustration of the forewing for this species and provide a sketch (Fig. 1C) that shows the reduced venation and distribution of color. The striking white costal region is not mentioned in descriptions available to me, and in fact is invisible when the wings are withdrawn beneath the scutellum.

As in related scutellerid genera, *Camirus* has subquadrate paramedian stridulatory areas on ventral segments 4 and 5, but they are almost invisible unless the specimen is turned into the correct inclination *vis-à-vis* a light source, when they are seen to consist of prominent long parallel striae. I could detect no corresponding plectral surfaces on the inner side of the metafemora aside from a few random subapical vertical striae which do not seem correctly placed to rub against the stridulatory surface.

#### FAMILY PENTATOMIDAE

##### Subfamily Pentatominae

#### *Proxys punctulatus* (Palisot de Beauvois)

At the time of preparing my 1971 treatment, I had seen material of this striking black and yellow species only from a few specimens taken in the cities of Richmond, Suffolk, Chesapeake, and Norfolk. From these localities I concluded the species observed the classical "Lower

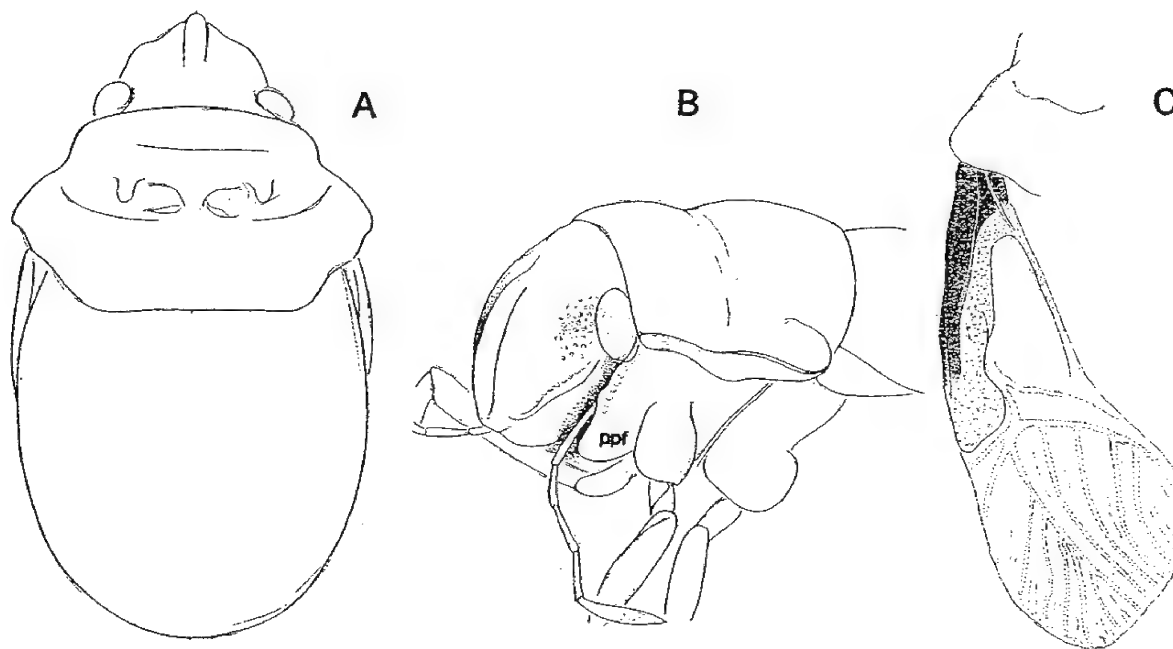


Fig. 1. *Camirus porosus*. A. Outline of body in dorsal aspect; B. Anterolateral aspect of forebody, showing deep insertion of the head into the prothorax and concealment of antennal socket under propleural flange (ppf); C. Left forewing. Heavily stippled area is dull black, lightly stippled area is ivory-white, unstippled areas are clear membrane, the veins are indicated somewhat more evidently than in actuality.

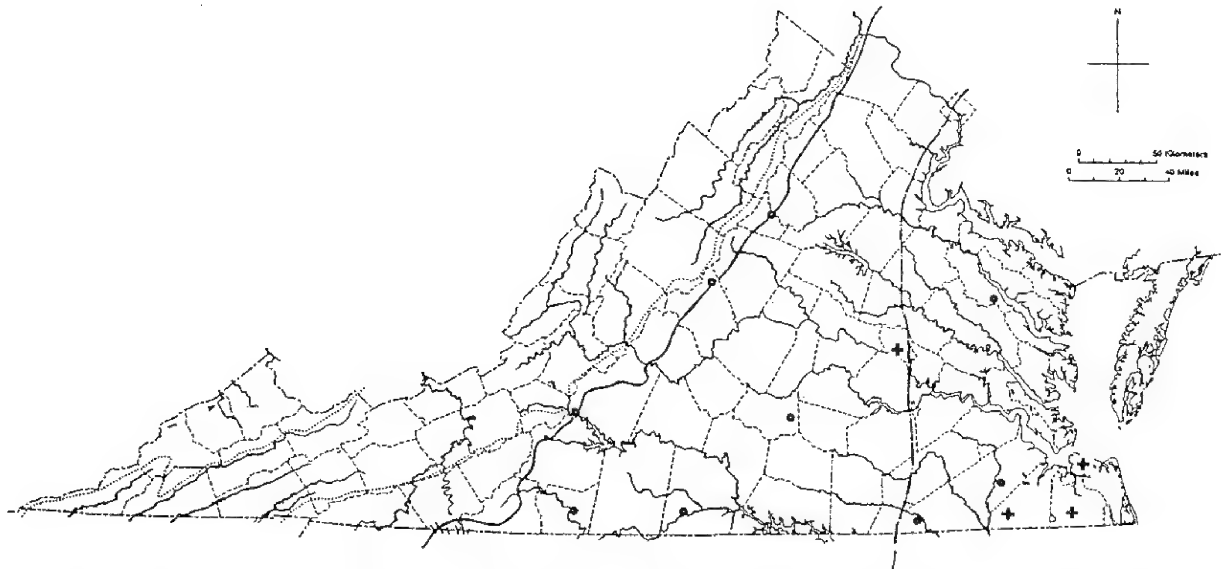


Fig. 2. Distribution of *Proxys punctulatus* in Virginia. Previously published records indicated by the plus symbols, new records by dots. Dashed line approximates the eastern edge of the Fall Line; solid line the eastern edge of the Blue Ridge.

Austral" distribution and was probably confined to the Coastal Plain in Virginia. Material subsequently acquired by VMNH demonstrates a distinctly greater range: essentially everywhere east of the Blue Ridge. New localities are in Essex, Greene, Greenville, Halifax, Henry, Isle of Wight, Nelson, Nottoway, and Roanoke counties and justify preparation of a new state range map (Fig. 2) for this species.

The westernmost capture sites correspond closely to a line drawn along the base of the Blue Ridge: *Greene Co.*: Conway River at Va. 230, 23 August 1980, RLH (1). *Nelson Co.*: Afton, 21 July 1973, J. Gainer (1). *Roanoke Co.*: Roanoke River at crossing of Blue Ridge Parkway, 29 June 1975, S. W. Bullington (1).

Although the species is attracted to UV light, specimens appear singly or in very small numbers, e.g., two from Greenville County on 15 July 1994. We have three specimens from Essex County taken in extensive Malaise trapping over a period of several seasons, an extremely low return considering the total trap effort of hundreds of hours.

#### Subfamily Asopinae

My 1971 treatment of Virginia pentatomoids did not admit this taxon at either the tribal or subfamilial level despite its treatment as a subfamily by Blatchley (1926) and other authorities. I herewith atone for that neglect by recognizing the Asopinae in the sense of Thomas (1992), who revised the asopine fauna of the Western Hemisphere

and introduced a considerable number of nomenclatorial changes which I now review in order to update the names used in my 1971 accounts.

Blatchley (1926: 93) distinguished the Asopinae from nominate Pentatominae by structure of the bucculae, long and parallel in the latter, almost entirely enveloping the slender basal segment of the rostrum, against short and convergent, enclosing only the basal half of the short, thick basal rostral segment in asopines. Thomas (1992: 8) was unable to define tribal groups among the 27 New World genera that he recognized despite a diversity of structural features. Five of these genera are represented in the Virginia fauna and can be distinguished as follows:

#### KEY TO THE VIRGINIA GENERA OF ASOPINAE

1. Scutellum broad and ovoid, covering inner angles of hemelytral coria and base of membrane, the apex broadly rounded.....*Stiretrus*  
– Scutellum subtriangular, distally acuminate, not covering hemelytra.....2
2. Rostrum very long, extending back to 2<sup>nd</sup> abdominal segment; pronotal humeri produced into blunt digitiform projection; color bluish-black with pronotum and scutellum variously ornamented with red markings.....*Euthyrhynchus*  
– Rostrum shorter, not extending beyond posterior coxae; humeri, if produced, acute or spinose; color not dark blue and red.....3



3. 4<sup>th</sup> segment of rostrum about twice as long as 3<sup>rd</sup>;  
color black and orange.....*Perillus*  
– 4<sup>th</sup> segment of rostrum about equal to 3<sup>rd</sup>; color  
yellowish to brownish.....4  
4. Jugae slightly longer than tylus; body length greater  
than 12 mm.....*Apoecilus*  
– Jugae and tylus equal in length; body less than  
12 mm long.....*Podisus*

### ***Euthyrhynchus floridanus* (Linnaeus)**

In 1971 I cited material from Appomattox, Gloucester, and Southampton counties, and the cities of Suffolk, Norfolk, and Newport News. Specimens at VMNH add Isle of Wight County and the cities of Hampton, Richmond, and Virginia Beach. A specimen from Kiptopeke State Park, at the southern end of Northampton County (S.M. Roble, 6 October 1996) establishes the species on the “Eastern Shore” and one from Grey’s Point, Middlesex County (J. Carnes, 29 October 1955) extends the Virginia range slightly northward to the Rappahannock River.

### ***Apoecilus cynicus* (Say)**

Thomas (1992: 25) elevated *Apoecilus* from subgeneric to generic rank, in the process incidentally removing the generic name *Apateticus* from the local fauna. As *Apateticus cynicus* I reported this large and conspicuous species from Burkes Garden, Tazewell County, its only then-known Virginia locality.

Recently collected VMNH specimens now represent the counties of Alleghany, Augusta, Bath, Bedford, Craig, and Dickenson, from sites on or west of the Blue Ridge. Robert Vigneault obtained eight specimens, mostly at lights, at Breaks Interstate Park, Dickenson County, during the first two weeks of July 2000.

### ***Podisus brevispinus* Thomas**

The specific name *modestus*, by which this insect was known for many decades, was determined by Thomas (1992: 93) to have been based upon a specimen of *P. maculiventris* (Say), thus requiring the proposal of the new name *brevispinus* for the present species. As *Podisus modestus* I recorded it (1971: 58) from only a few specimens captured in Montgomery and Grayson counties. Recently acquired material originated in Augusta, Bath, Botetourt, Dickenson, Floyd, Giles, Highland, Nelson, Rockingham, Smyth, Tazewell, and Washington counties, from sites on or west of the Blue Ridge and nearly all above 3000 ft. elevation.

### ***Podisus placidus* Uhler**

New state record, new southernmost locality

A boreal species stated by Blatchley to have been “. . .not recorded south of New Jersey.” Localities cited by Froeschner (1988: 556) define a range from Quebec to Alberta and Utah, again with nothing south of New Jersey and Ohio. VMNH has a single female collected by Malaise trap in *Clarke Co.*: Blandy Experimental Farm, 3 mi. S Boyce (D. R. Smith, 2 July 1991), which adds the species to the state list of insects, and constitutes a considerable southward extension of the known range. Whether this specimen derived from a native population, or was introduced via shrubbery (Blandy Farm hosts a variety of exotic cultivars) remains to be determined by future collections in Virginia and neighboring states.

The combination of straight pronotal margins, immaculate legs and membrane, and extensive random brown blotching of the dorsum readily distinguish this species from other local members of the genus.

### ***Podisus neglectus* (Westwood)**

Based on a single female without indication of origin, this species fell into an obscurity that was a credit to its name. The type specimen was apparently not restudied by a pentatomid specialist until Thomas found it in the British Museum collection and recognized the species as that described much later as *P. fretus* (Olsen, 1916) from specimens taken in Massachusetts. Ranging from Maine to Florida along the seacoast, with disjunct populations in the Great Lakes region; the species appears to be uncommon in Virginia as no specimens have been taken here since I reported two specimens (USNM) from Virginia Beach. Since there has been no dearth of collecting activities in the two “Eastern Shore” counties and extreme southeastern Virginia by staff of the Division of Natural Heritage, perhaps some special collecting techniques are required to obtain specimens of *P. neglectus*. That an actual hiatus in the range may occur, however, is suggested by the apparently analogous case of another coastal pentatomid, *Thyanta custator* (Fabricius), of which no specimens have been taken between New Jersey and North Carolina.

### ***Podisus serieventris* Uhler**

Known states of record for this species clearly reflect a northern, subboreal distribution from Newfoundland to British Columbia, and southward to North Carolina and Utah. Curiously, the only Virginia records I could cite in 1971 were for Arlington and Fairfax counties, in the Piedmont rather than the mountains, an anomaly paralleled by the localities then known for North Carolina.

Since 1971, a few captures have been made in the Virginia mountains: *Dickenson Co.*: Breaks Interstate Park, 1-14 July 2000, Robert Vigneault (6), and *Highland Co.*: Locust Spring Recreation Area, George Washington National Forest, 29 April 1972, R. L. and L. S. Hoffman (1). Collectively, these do not add up to a very adequate picture of the in-state distribution.

The addition of *P. placidus* to the state fauna and the several name changes mentioned above require revision of the key that I prepared in 1971.

#### KEY TO THE VIRGINIA SPECIES OF *PODISUS*

1. Dorsolateral margin of pronotum straight; legs and membrane immaculate; dorsum mostly pale beige mottled with irregular brown blotches.....*P. placidus*  
– Dorsolateral margin of pronotum concave or indented near midlength; membrane with median stripe; dorsum colored otherwise.....2
2. Legs immaculate yellow; median projection of 2<sup>nd</sup> ventral segment short, not extending between metacoxae; body length less than 10 mm.....*P. brevispinus*  
– Legs variously marked with spots or annulations; median projection of 2<sup>nd</sup> ventral segment longer, usually extending between bases of metacoxae; length greater than 10 mm.....3
3. Femora of all legs with two black subapical spots .....*P. maculiventris*  
– Femora variously marked but never with two subapical dark spots.....4
4. Antennae uniformly light reddish-brown; midventral abdominal spots large (size of an eye, or larger) and poorly-defined.....*P. neglectus*  
– 3<sup>rd</sup> and 4<sup>th</sup> antennomeres distinctly darker than basal; midventral abdominal spots small and sharply defined.....*P. serieventris*

#### SUMMARY

The 84 species of Pentatomoidea now known to occur in Virginia are distributed among four families as follows:

Scutelleridae	8
Cydnidae	14
Corimelaenidae	11
Pentatomidae	51

The proximity of capture sites for other species in adjoining states suggests that this total may increase to about 90 through continued collecting efforts.

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## Second Update to the Survey of Macrolepidopteran Moths Near Vontay, Hanover County, Virginia

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### INTRODUCTION

This paper provides a second update to the list of macrolepidopteran moth (= "macro-moth" or "macro") species collected at a site on the Virginia Piedmont, 2 km W of Vontay in western Hanover County. A description of the study site, methodology, and original species list were given in Ludwig (2000) and the first update was provided in Ludwig (2001). The new collections extend the study to five years (30 October 1996 to 30 October 2001) and increase the number of collection nights to >470. The species list from this study, along with others being gathered throughout Virginia by the Virginia Department of Conservation and Recreation's Division of Natural Heritage, is being used to ascertain the biological status and develop a complete list of the Commonwealth's macro-lepidopteran moths.

### RESULTS AND DISCUSSION

A total of 82 macrolepidopteran moth specimens was pinned and identified during the extended study period, bringing the total number of collected specimens at this site to 2,170. These collections increased the number of species documented at this site from 521 to 530 and the number of genera from 298 to 300 (Table 1 and Appendix). The Noctuidae (310 species) and Geometridae (103) were most diverse with the Arctiidae (34) and Notodontidae (33) also rich.

An updated species-accumulation curve (Fig. 1) for this study indicates that additional macros will be recorded at the site should collections continue. Depending upon the projected trajectory of the curve, estimates of the total number of taxa recorded from this site over 10 years range from 570-680 macro-moth species, representing perhaps as much as 50% of the state's estimated total macro fauna.

Noted as absent from the site's original collections (Ludwig, 2000), two Eurasian moth species have now been recorded at the study site. A single *Noctua pronuba* L. was found on 29 May 2000 (Ludwig, 2001), reinforcing its status as a widespread, recent introduction to Virginia (Roble et al., 1999). A male gypsy moth, *Lymantria dispar* L., was found on 3 July 2001, presumably representing the first of many to inhabit the site as the line of infestation moves south and east from the northwestern Virginia Piedmont.

Table 1. Summary of macro-moths encountered during this study by family given in order of Hodges et al. (1983).

Family	Genera	Species	Specimens
Thyatiridae	2	2	9
Drepanidae	3	3	7
Geometridae	69	103	394
Epiplemidae	2	2	5
Mimallonidae	1	1	6
Apatelodidae	2	2	4
Lasiocampidae	4	5	8
Saturniidae	10	11 <sup>a</sup>	12
Sphingidae	12	18 <sup>b</sup>	33
Notodontidae	18	33	138
Arctiidae	18	34	94
Lymantriidae	3	6	26
Noctuidae	158	310	1434
TOTALS	300	530	2170

<sup>a</sup> Four species documented by sight records only

<sup>b</sup> One species documented by sight record only

## ACKNOWLEDGMENTS

Rebecca Wilson assisted with fieldwork. Manuscript preparation was funded in part by the Virginia Department of Conservation and Recreation, Division of Natural Heritage. All specimens are currently housed in the DNH reference collection.

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Appendix. Additional macro-moth species identified during this study given in order of Hodges et al. (1983). Fields are: checklist number, species name, collection date (month/day/year), method (s=sugar bait, b=black light, i=incandescent light, m=mercury vapor light); numbers in parentheses indicate if number of specimens is > 1 for a given date and survey method. Asterisks denote species new for the study.

**Drepanidae**

6251 *Drepana arcuata* (Wlk.) 04/06/01 m

**Geometridae**

6258 *Alsophila pometaria* (Harr.) 02/20/01 i  
 \*6405 *Semiothisa gnophosaria* (Gn.) 05/25/01 m  
 6586 *Anacamptodes defectaria* (Gn.) 04/17/01 m  
 6662 *Paleacrita vernata* (Peck) 02/20/01 i  
 6843 *Plagodis fervidaria* (H.-S.) 07/08/01 m  
 6885 *Besma quercivoraria* (Gn.) 05/02/01 m  
 6894.x *Lambdina athasaria* (Wlk.) complex 04/17/01 m  
 7033 *Nemoria lixaria* (Gn.) 09/25/01 m  
 7132 *Pleuroprucha insularia* (Gn.) 09/25/01 i  
 7196 *Eulithis diversilineata* (Hbn.) 07/14/01 m  
 7292 *Hydria prunivorata* (Fgn.) 06/12/01 m  
 \*7638 *Cladara angulinea* (Grt.&Rob.) 04/06/01 m

**Saturniidae**

7765 *Callosamia angulifera* (Wlk.) 06/16/01 m,  
 07/13/01 m

**Sphingidae**

\*7786 *Ceratomia amyntor* (Geyer) 07/28/01 m

**Notodontidae**

\*7896 *Clostera inclusa* (Hbn.) 04/06/01 m  
 7931 *Gluphisia septentrionalis* (Wlk.) 05/15/01 m  
 7999 *Lochmaeus bilineata* (Pack.) 08/13/01 m

**Arctiidae**

8104 *Comachara cadburyi* Franc. 05/02/01 m

**Lymantriidae**

8314 *Orgyia definita* Pack. 07/06/01 m,  
 07/28/01 m, 10/06/01 m (2)  
 \*8318 *Lymantria dispar* (L.) 07/03/01 m

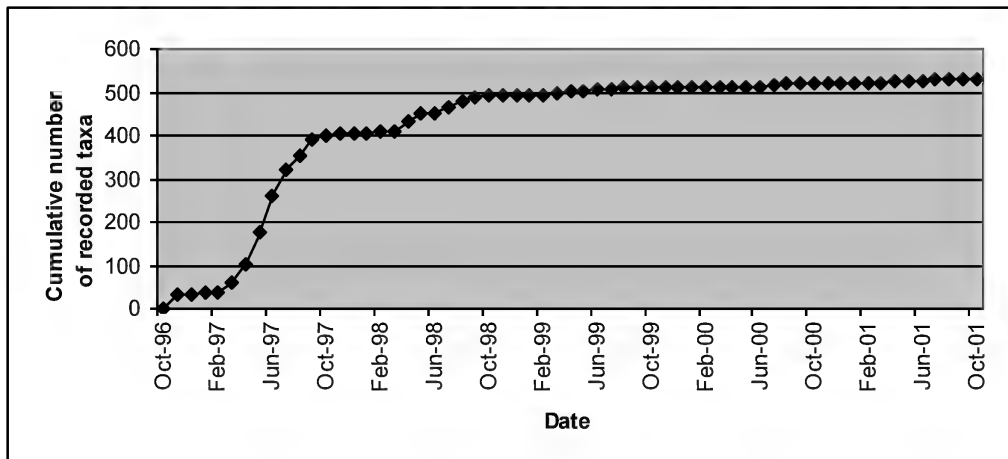
**Noctuidae**

8338 *Phalaenophana pyramusalis* (Wlk.) 05/25/01 m  
 8426 *Dyspyralis illocata* Warr. 06/11/01 m

## Noctuidae (continued)

8499	<i>Metalectra discalis</i> (Grt.)	09/10/01 m	9427	<i>Meropleon diversicolor</i> (Morr.)	09/25/01 m
8505	<i>Metalectra richardsi</i> Brower	07/12/01 m	9466	<i>Papaipema cataphracta</i> (Grt.)	10/03/01 i, 10/16/01 i, 10/20/01 i
8525	<i>Phyprosopus callitrichoides</i> Grt.	07/24/01 m	9485	<i>Papaipema baptisiae</i> (Bird)	09/18/00 m
8692	<i>Zale galbanata</i> (Morr.)	07/24/01 m	9501	<i>Papaipema eupatorii</i> (Lyman)	10/03/01 i
*8703	<i>Zale duplicata</i> (Bethune)	04/03/01 m	9556	<i>Chytonix palliatricula</i> (Gn.)	05/25/01 m
8792	<i>Catocala vidua</i> (J.E. Sm.)	09/25/01 m	9688	<i>Galgula partita</i> Gn.	07/01/01 m, 07/04/01 m (2), 07/06/01 m, 07/14/01 m
8849	<i>Catocala andromedae</i> Gn.	07/06/01 m	9892	<i>Lithophane disposita</i> Morr.	10/20/01 i
8898	<i>Allagrapha aerea</i> (Hbn.)	07/28/01 m	9961	<i>Anathix ralla</i> (Grt. & Rob.)	09/10/01 m
8904	<i>Chrysanympha formosa</i> (Grt.)	06/11/01 m	10021	<i>Copivaleria grotei</i> (Morr.)	04/06/01 m
8907	<i>Megalographa biloba</i> (Steph.)	05/15/01 m	10304	<i>Trichordestra legitima</i> Grt.	09/01/01 m
8959	<i>Paectes pygmaea</i> (Hbn.)	08/13/01 m	10368	<i>Lacinipolia meditata</i> (Grt.)	09/20/01 m
8962	<i>Paectes abrostoloides</i> (Gn.)	10/16/01 i	10397	<i>Lacinipolia renigera</i> (Steph.)	09/20/01 m
9037	<i>Hyperstrotia pervetens</i> (B.&McD.)	06/05/01 m	10501	<i>Crocigrapha normani</i> (Grt.)	04/17/01 m
9038	<i>Hyperstrotia villificans</i> (B.&McD.)	05/15/01 m (2)	10502	<i>Himella intractata</i> (Morr.)	04/12/01 m
9040	<i>Hyperstrotia secta</i> (Grt.)	05/15/01 m	10518	<i>Achatia distincta</i> Hbn.	04/12/01 m, 05/02/01 m
9051	<i>Lithacodia musta</i> (Grt.&Rob.)	06/05/01 m, 08/13/01 m	10521.1	<i>Morrisonia latex</i> (Gn.)	05/02/01 m
9062	<i>Cerma cerintha</i> (Tr.)	06/10/01 m	10648	<i>Agrotis gladaria</i> Morr.	10/06/01 m
9169	<i>Bagisara rectifascia</i> (Grt.)	07/04/01 m	10915	<i>Peridroma saucia</i> (Hbn.)	04/14/01 m
*9221	<i>Acronicta funeralis</i> (Grt. & Rob.)	06/12/01 m	10944	<i>Xestia smithii</i> (Snell.)	09/24/01 m
9243	<i>Acronicta ovata</i> Grt.	07/28/01 m	10998	<i>Choephora fungorum</i> Grt. & Rob.	10/03/01 i
9244	<i>Acronicta modica</i> Wlk.	05/15/01 m	11006	<i>Protolampra brunneicollis</i> (Grt.)	09/25/01 m
9251	<i>Acronicta retardata</i> (Wlk.)	05/02/01 m	11128	<i>Schinia arcigera</i> (Gn.)	09/20/01 m
*9272	<i>Acronicta oblanita</i> (J.E. Sm.)	06/10/01 m	*11135	<i>Schinia rivulosa</i> (Gn.)	08/20/01 m

Figure 1. Species accumulation curve for macrolepidopteran moths encountered during this study.



## Status of the Rare Skipper (*Problema bulenta*) in Virginia

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The life history of the rare skipper (*Problema bulenta*) is poorly documented. It is associated with tidal marshes or upland habitats with abundant nectar sources in the vicinity of tidal marshes. Larvae are suspected to feed on giant cordgrass (*Spartina cynosuroides*), southern wild rice (*Zizaniopsis miliacea*), and wild rice (*Zizania aquatica*) (Opler & Krizek, 1984; Cromartie & Schweitzer, 1993; Glassberg, 1999). Recently, late instar larvae were found on *Phragmites australis* in New Jersey (D. F. Schweitzer, pers. comm.). Despite the widespread occurrence of apparently suitable habitat, the rare skipper tends to be highly localized and sporadic in distribution.

The rare skipper has been documented from seven states along the Atlantic coast: New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia (Cromartie & Schweitzer, 1993; Opler, 1998). The rare skipper was formerly a candidate (Category 2) species for listing under the federal Endangered Species Act, until the U.S. Fish and Wildlife Service abolished that category in 1996. Currently, it receives no legal protection in any of the states in which it occurs, despite its rarity and patchy distribution.

The rare skipper has one brood from late-July to August in the northern portion of its range (Opler & Krizek, 1984). There are records from May and early June indicating it is double-brooded in the southern portion of its range (Opler & Krizek, 1984). In Virginia, Nicolay (1979) proposed that the rare skipper might be double-brooded, while Opler & Krizek (1984) suggested that it is single-brooded. All of the Virginia collections to date are from late-July and August; however, extensive survey efforts have not been conducted earlier in the year.

In Virginia, J. Bauer and B. Dixon first collected *P. bulenta* on 21 August 1967 (Covell & Straley, 1973). The location was reported as 2.0 miles (3.2 km) south of Lanexa, New Kent County. The area consists of

tidal marshes along the Chickahominy River near its confluence with Diascund Creek (Nicolay, 1979; Pague, 1991; Hobson, pers. obs.). R. Anderson, S. Nicolay, C. Covell, and G. Straley collected *P. bulenta* from the flowers of swamp milkweed (*Asclepias incarnata*) at this location in August 1970 (Covell & Straley, 1973). Anderson and Nicolay captured it again in August of 1971, but efforts by Anderson in mid-July 1971 were unsuccessful (Covell & Straley, 1973).

C. S. Hobson and S. M. Roble reverified this population on 23 August 1999, when they observed nine adults at two marshes upstream of the mouth of Diascund Creek. Eight of the individuals were seen nectaring on pickerelweed (*Pontederia cordata*) about 1-1.75 km upstream of the mouth of Diascund Creek in New Kent County. One individual was on swamp milkweed approximately 6 river km upstream of the mouth of Diascund Creek, Charles City County (new county record). A survey conducted at these sites on 31 August 1999 did not find any *P. bulenta*, however weather conditions were less than favorable.

Associated butterflies and skippers at these capture sites included broad-winged skipper (*Poanes viator*), orange sulphur (*Colias eurytheme*), palamedes swallowtail (*Papilio palamedes*), red admiral (*Vanessa atalanta*), fiery skipper (*Hylephila phyleus*), spicebush swallowtail (*Papilio troilus*), tiger swallowtail (*Papilio glaucus*), and monarch (*Danaus plexippus*).

Vegetation at the capture sites is characterized by dense stands of southern wild rice mixed with wild rice, pickerelweed, arrow arum (*Peltandra virginica*), and two species of mallows (*Hibiscus moscheutos*, *Kosteletzkya virginica*). Giant cordgrass was not observed in the vicinity of the captures, but was found in small patches within three miles downstream of Diascund Creek. Bald cypress (*Taxodium distichum*) is prevalent along the floodplain in the vicinity of the capture sites.

Additional surveys of other tidal marshes in Virginia in 1999 failed to document the presence of

*P. bulenta*. These included surveys along the Rappahannock, Mattaponi, and Pamunkey rivers. Extensive surveys of marshes along the Rappahannock River were also conducted in July and August of 2001 without success.

While conducting zoological surveys in 2001 for the National Park Service at Colonial National Historical Park – Jamestown Island, *P. bulenta* was observed by Chazal and others at one small, fringe marsh over the course of several weeks. The marsh is approximately 50 m long by 20 m wide and is approximately 0.8 mi (1.25 km) north of Travis Cemetery on Jamestown Island, in James City County, Virginia (new county record). The area within which *P. bulenta* was observed covers approximately 6.4 acres (2.6 ha). This is only the second known Virginia population of this species and is approximately 24 air km south of the previously known site on the Chickahominy River.

Emergent vegetation in this area includes giant cordgrass, arrow arum, narrow-leaved cattail (*Typha angustifolia*), and pickerelweed. Larger, surrounding marshes contain giant cordgrass, arrow-arum, wild rice, dotted smartweed (*Polygonum punctatum*), halberd-leaf tearthumb (*Polygonum arifolium*), Walter's barnyard grass (*Echinochloa walteri*), bull-tongue arrowhead (*Sagittaria lancifolia*), and other species. Several stems of swamp milkweed were observed along the edge of the marsh on the upland side.

On 19 July 2001, one *P. bulenta* was collected; however, it was not identified until about one month later and its precise capture location is uncertain. Based on surveys in the area after this finding, and the highly localized behavior of the species, the collection was almost certainly made in the same fringe marsh as the subsequent observations and collections. On 15 August, 8-9 individuals of *P. bulenta* were observed in the outer portions of the marsh. The highest population count occurred on 22 August when 139 individuals were observed near the Colonial Parkway. A majority (106) of those seen on this date were observed nectaring on 20-30 flower heads of swamp milkweed (Fig. 1). On 30 August, only ten *P. bulenta* were observed. It was also noted that the swamp milkweed flower heads were either spent, or appeared to have been browsed by white-tailed deer (*Odocoileus virginianus*). Rare skippers were last observed on 6 September when four individuals were seen. None were seen on 13 September.

The rare skippers were observed nectaring mainly on swamp milkweed and pickerelweed with two individuals observed nectaring on rattlesnake master (*Eryngium aquaticum*). Outside of Virginia, other reported nectar sources of *P. bulenta* include

buttonbush (*Cephalanthus occidentalis*), common milkweed (*Asclepias syriaca*), dogbane (*Apocynum cannabinum*), swamp rose mallow (*Hibiscus palustris*), and seashore mallow (*Kosteletzkya virginica*) (Krizek & Opler, 1986; Cromartie & Schweitzer, 1993). The latter authors listed numerous additional, infrequently visited plants.

Other lepidopterans observed in the same area of Jamestown Island included broad-winged skipper, sedge skipper (*Euphyes dion*), Delaware skipper (*Anatrytone logan*), silver-spotted skipper (*Epargyreus clarus*), and monarch.



Fig. 1. Adult rare skipper (*Problemata bulenta*) on swamp milkweed (*Asclepias incarnata*).

#### ACKNOWLEDGMENTS

Many people assisted with fieldwork during the surveys conducted at Colonial National Historical Park, including Joe Weber, Gina Pisoni, Kathy Derge, and Lisa Page Carter. Funding for the surveys was provided by the United States Department of the Interior, National Park Service, through cooperative agreement number 4000-8-9027 number 2 with the Virginia Department of Conservation and Recreation, Division of Natural Heritage. The Virginia Department of Agriculture and Consumer Services in cooperation with the U. S. Fish and Wildlife Service provided funding to the Virginia Department of Conservation and Recreation, Division of Natural Heritage for the fieldwork conducted in 1999. Steve Roble, Amber Foster, Dean Walton, and Phil Coulling provided field assistance.

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## First Virginia Records for Three Species of Centipeds (Geophilomorpha: Schendylidae)

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The recent annotated list of Virginia centipeds (Hoffman, 1995) admitted 56 species confirmed for the state as well as 19 others considered as likely to be found here. Yet, despite ongoing collecting efforts in the past six years, disappointingly little augmentation of the original total has taken place. We take this occasion to put on record three species of the family Schendylidae new to Virginia, two of them more or less anticipated, the third so far out of its known range as to be of particular biogeographic interest.

With these additions, Virginia is known to harbor no fewer than six species of schendylids, the greatest number recorded for any state, and hardly equalled by any area of comparable size in the world. Yet it is entirely probable that additional endemic species remain to be discovered here.

### SCHENDYLIDAE

The distribution of this family is curious. By far the great majority of both genera and species occur throughout the Neotropical, Indoaustralian, and Afrotropical regions, but another contingent is distinctly Holarctic and notably psychrophilus in terms of surface activity. The group itself was not established until 1896, when O. F. Cook dismembered the old Geophilidae into nine clearly-defined families. At that time, Cook knew only one endemic genus (*Escaryus*) and its two species in eastern North America, in addition to a European species introduced into New York state.

Subsequently the Nearctic fauna was shown in many papers by R. V. Chamberlin to be large and diverse, with its greatest development in southwestern United States. The fauna of northeastern United States (two genera, four

species) was treated by Crabill (1953), who later (1961) provided a catalog of the schendylids of North America, including Mexico (11 genera, 40 species, nearly all named by Chamberlin). Most recently, the present authors published a revision of the genus *Escaryus*, recognizing eight Nearctic species (Pereira & Hoffman, 1993). Since our native schendylids are normally found only during the colder months (or at high elevations in our latitude), they are not adequately represented in collections, and undoubtedly many major contributions to their knowledge remain to be made. This is shown clearly by our discovery in 1988 of two sympatric new species of *Escaryus* in the Virginia Blue Ridge, and by the three species of Schendylidae here added to the known fauna of the state.

### **Schendyla nemorensis** (C. L. Koch)

This species is common in western Europe, and like so many other small soil animals has been introduced into a hospitable North America where it is now widely dispersed and abundant in urbanized areas of the northern states. Crabill (1953) mentioned localities in Connecticut, Illinois, Massachusetts, Michigan, New Hampshire, New York, and Utah, and predicted eventual discovery in many others. We now add Virginia, apparently the southernmost established state of record:

*Roanoke Co.*: Salem, 1 February 2002, 2 ♂♂ (VMNH). A sample of soil taken beneath a white pine in his backyard by Dr. Jorge Santiago-Blay and processed by Berlese extraction at VMNH yielded these specimens. The larger is 20 mm in length, with 39 pairs of legs; both agree in every respect with the detailed description and illustrations published by Brölemann & Ribaut (1912).

The species is easily recognized by the form of the terminal legs of males (Fig. 1). Males of *Escaryus* likewise have enlarged podomeres, but they are densely setose and the terminal article is not so strongly reduced and set off. *S. nemorensis* differs also in having only four coxopleural pores instead of 12 or more, and in that the terminal claw of the second maxillae is not pectinate. Both conditions can be seen without dissection from a specimen mounted in ethylene glycol or lactic acid.

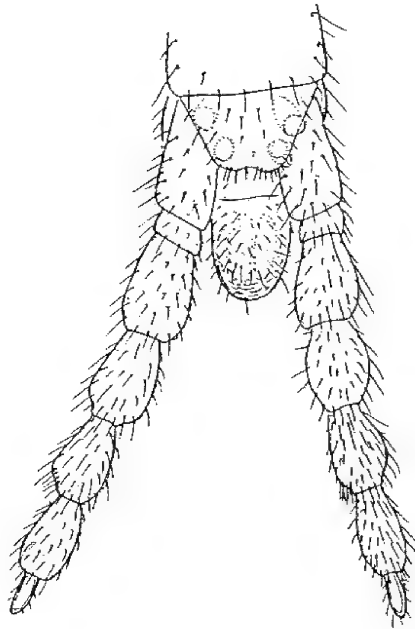


Fig. 1. *Schendyla nemorensis*, posterior end of body in ventral aspect, showing form of the last pair of legs with the reduced 7<sup>th</sup> podomere, and position of the four coxopleural pores beneath the last sternal plate, characters which distinguish this species from other local geophilomorphs. Specimen from Salem, Virginia.

#### ***Escaryus liber* Cook & Collins**

Originally described from New York state, this species remained largely unknown until Crabill's treatment in 1953, when he added localities for Ohio, Maryland, and the District of Columbia. The last two places almost guaranteed discovery of *E. liber* in Virginia, and this had even happened some years before the work by Pereira & Hoffman (1993) appeared. Ironically, the specimen was at VMNH but unknown to them, in a backlog of unsorted samples.

*Rockbridge-Bedford Cos.*: Blue Ridge Parkway, 0.5 mi N Petite's Gap, in pine-maple woods, 3 December 1988, W.A. Shear (VMNH 1♀ adult, 25 mm long, with 51 pairs of legs, both spermathecae contain mature

spermatozoa).

The species has not been recovered despite several attempts made at the specified site and higher on Apple Orchard Mountain. It has been described and illustrated in detail by Pereira & Hoffman (1993).

#### ***Escaryus ethopus* Chamberlin**

Heretofore this species has been recorded only from Alaska and Yukon Territory, Canada (Pereira & Hoffman, 1993, Map 1). Although widely disjunct distributions between the Appalachians and western North America have long been known, they have been almost invariably at the generic level. The present case involves a separation of more than 2600 mi/4160 km and displacement far to the south from the subarctic primary area (Fig. 2). Fragmentation of a once continuous North American range may be invoked as the only plausible explanation; the existence of other small disjunct populations may be reasonably assumed.



Fig. 2. Outline map of North America, showing primary range of *Escaryus ethopus* in Canada and Alaska (shaded), and location of site in the Virginia Blue Ridge (arrow).

*Rockbridge-Bedford Cos.*: Blue Ridge Parkway, 0.5 mi N Petite's Gap, in pine-maple woods, 3 December 1988, W. A. Shear (VMNH 1 ♀ adult, 40 mm long, with 49 pairs of legs, seminiferous tubules with mature spermatozoa).

This specimen agrees with the detailed description of *E. ethopus* (Pereira & Hoffman, 1993: 52-56) in every respect except that the pretergum of the last pedal segment is separated from the pleurites by sutures. Whether this single difference is only an aberration or reflects a constant difference in the Virginia population cannot be ascertained until more material has been examined. Regrettably, despite numerous attempts to recollect this species at the specified locality and other sites in the central Blue Ridge, no additional specimens have been obtained. As with many minute soil animals, capture is often a matter of mere serendipity, and sampling efforts may miss a population by only a few meters.

#### ***Escaryus urbicus* (Meinert)**

This species has been recorded (Pereira & Hoffman, 1993: 16) from western Virginia: Alleghany, Augusta, Bland, Giles, and Nelson counties. It is now possible to add an additional capture site: *Floyd Co.*: Buffalo Mountain Natural Area Preserve, north slope pitfall site at 3400 ft., December 2001-11 April 2002, (VMNH 1 ♂, ca. 34 mm long, with 41 pairs of legs). This specimen agrees closely with the detailed description and illustrations presented by Pereira & Hoffman (1993; Figs. 1-10), except that the labral teeth are much more distinct and darkly pigmented than shown in their Fig. 8, which may have been of an atypical condition. The appearance is much more like that represented for *E. cryptorobius* (Pereira & Hoffman, 1993; Fig. 55).

Although the new locality is only slightly further south than that in Bland County, it establishes the species less than 30 miles from North Carolina and the discovery of *E. urbicus* in that state is virtually assured. *Escaryus cryptorobius* has been taken syntopically at Buffalo

Mountain, although from Berlese extractions rather than pitfalls.

#### ACKNOWLEDGMENTS

We express our appreciation to Dr. Jorge Santiago-Blay and Prof. William A. Shear for generously donating material upon which this report is based to the Virginia Museum of Natural History.

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## SHORTER CONTRIBUTIONS

*Banisteria*, Number 19, 2002

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**SPRING DRAGONFLY (ODONATA) AND BUTTERFLY (LEPIDOPTERA) FALLOUT AT THE CHESAPEAKE BAY BRIDGE-TUNNEL.**--Large groups of migrating Odonata are rare, especially in spring (Russell et al., 1998). On 27 May 2000, from about 1530 h to 1630 h, I encountered a fallout, or mass grounding, of dragonflies, butterflies, and other insects on the Chesapeake Bay Bridge-tunnel, at the mouth of Chesapeake Bay. The "other" insects were mostly beetles and were not studied. A thunderstorm was rapidly approaching, that soon produced heavy rain, causing me to leave after making observations on the three northernmost of four total man-made islands. The temperature was about 32° C and humidity was near 100%. Winds were moderate from the east and had been strong, from the east, off the ocean, for the previous two days.

I am a volunteer bird and butterfly researcher for Coastal Virginia Wildlife Observatory and while the Observatory has conducted regular butterfly surveys at the tip of Virginia's Eastern Shore since 1995, dragonfly study has been very limited. The bridge-tunnel is a well-known migrant bird trap at all seasons (Kain & Brinkley, 1997) and I have crossed it regularly throughout the year for more than 25 years and have not witnessed a similar insect fallout there.

I am not a dragonfly expert, but I am familiar with many species. I made sketches and notes of the dragonflies that were perched on the building walls and could be examined closely. I later made my identifications using Dunkle (2000) and the dragonfly website at <http://members.bellatlantic.net/~dbarber/odonatology.html>. I counted more than 500 dragonflies on the 10 m by 10 m brick south wall of the building on the next to southernmost island. Many appeared to be escaping the strong wind by resting on the walls, but others were flying or were perched on vegetation out in the open. I estimated a total of 4,500 dragonflies over a distance of about 13 km along the bridge-tunnel.

Although I must have missed some species due to limited study time, nine species of dragonflies were identified. Estimates of the percentage of each species, made mainly from the close observations of those perched on the walls, are in Table 1. I was able to confirm the presence of both males and females for *Anax junius*, *Pachydiplax longipennis*, *Gomphaeschna furcillata*, *Erythemis simplicicollis*, and *Libellula vibrans*.

Table 1. Dragonflies recorded during fallout on 27 May 2000 at the Chesapeake Bay Bridge-tunnel.

Common Name	Scientific Name	Estimated % of Total
Common Green Darner	<i>Anax junius</i>	25
Eastern Pondhawk	<i>Erythemis simplicicollis</i>	25
Harlequin Darner	<i>Gomphaeschna furcillata</i>	10
Blue Dasher	<i>Pachydiplax longipennis</i>	10
Great Blue Skimmer	<i>Libellula vibrans</i>	10
Swamp Darner	<i>Epiaeschna heros</i>	10
Halloween Pennant	<i>Celithemis eponina</i>	5
Eastern Amberwing	<i>Perithemis tenera</i>	5
Saddlebags sp.	<i>Tramea</i> sp.	<1

I roughly estimated butterfly numbers at several hundred. They were common species that I am familiar with, however, because of the impending storm and my interest in the dragonflies, time was not taken to differentiate Clouded from Orange Sulphur nor Question Mark from Comma nor American Lady from Painted Lady. The list of butterflies identified with estimates of the percentage of each species seen is contained in Table 2.

Table 2. Butterflies recorded during fallout on 27 May 2000 at the Chesapeake Bay Bridge-tunnel.

Common Name	Scientific Name	Estimated % of Total
Clouded/Orange	<i>Colias philodice</i> /	25
Sulphur	<i>C. eurytheme</i>	
Red Admiral	<i>Vanessa atalanta</i>	25
Common Buckeye	<i>Junonia coenia</i>	25
American/Painted	<i>Vanessa virginiensis</i> /	10
Lady	<i>V. cardui</i>	
Comma/	<i>Polygonia comma</i>	10
Question Mark	<i>P. interrogationis</i>	
American Snout	<i>Libytheana carinenta</i>	5

On 3 June 2000, I visited the bridge-tunnel again and found dozens of dragonflies still present, though many were sluggish and could be captured by hand. I was able to measure and photograph several species. The Internet site for the North American Dragonfly Migration Project (<http://members.bellatlantic.net/~dbarber/migrant/mig.html>) described, with moving graphics, a "frontal boundary and radar visible migration" along the East Coast on 3 June 2000.

Possible reasons for mass migrations of dragonflies in spring include dispersal from drought-affected areas, sustained southerly winds, and population increases. These movements may not be annual events and probably vary greatly in magnitude (Soltesz et al., 1995).

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Kain, T., & N. Brinkley. 1997. Chesapeake Bay Bridge-tunnel islands. Pp. 39-43 In D. W. Johnston (compiler). A Birder's Guide to Virginia. American Birding Association, Inc., Colorado Springs, CO.

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Banisteria, Number 19, 2002

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RECORDS FOR WINTER SCORPIONFLIES IN VIRGINIA (MECOPTERA: BOREIDAE).--Although the great majority of mecopterans are active as adults during the warmer months of the year, there is a small and hardy contingent, species of the family Boreidae, which has become adapted to life during the cold winter periods and may even be found walking actively on snow. This seasonal preference has resulted in a group of insects somewhat less well known than their thermophilus relatives, and even the details of their geographic distribution remain to be worked out. Knowledge of this family was summarized several decades ago (Penny, 1977) in a useful and complete monograph, which serves as a baseline upon which local studies can be superimposed. Penny recognized ten Nearctic species of the major genus *Boreus*, of

which only two occur in the eastern states, and provided distributional maps which reflected the paucity of museum material available to him at the time. Although it is understandable that traditional hand-capture methods have not been extensively employed, the scarcity of Virginia records is surprising, considering that pitfall trap lines have been operated throughout the year at localities across the state including White Top Mountain. The following is a summary of known Virginia records based on literature and material in the Virginia Museum of Natural History (VMNH, identifications by G. W. Byers) and the National Museum of Natural History (USNM, identifications by O. S. Flint).

*Boreus brumalis* (Fitch). The main body of this species' range extends from Ontario and Maine west through Michigan and Ohio and south to the Great Smoky Mountains, Tennessee, with disjunct outlying segments in Minnesota, Wisconsin, and Illinois. There appear to be no published localities for the relatively well-collected states of Arkansas (Robison et al., 1997) and Kentucky (Byers & Covell, 1981). Byers (1962) published a record for Quantico, Prince William County, Virginia. Penny (1977) plotted only two Virginia records, including the foregoing and another in Giles County, presumably at or near Mountain Lake.

New Virginia records are: *Arlington Co.*: Arlington, 11 December 1960, A. B. Gurney (USNM 2). *Augusta Co.*: George Washington National Forest (GWNF), timber management compartment 460-5, ca. 5 mi W Stokesville, 18 May 1988, Barry D. Flamm (VMNH 1), same site and collector, 22 December 1988 (VMNH 1). Shenandoah Mountain, 5 mi S Reddish Knob on FS Rt. 85, 17 June 1988, Kurt A. Buhlmann (VMNH 1); same site and collector, 19 November 1988 (VMNH 1). *Fairfax Co.*: Dead Run, on snow, 20 January 1957, A. B. Gurney (USNM 2); Falls Church, on snow, 18 December 1957, A. B. Gurney (USNM 1); River Bend Park, Great Falls, 2 January 1955, G. B. Vogt (USNM 1). *Loudoun Co.*: Appalachian Trail near Round Hill, 8 February 1970, O. S. Flint, Jr. (USNM 16). *Page Co.*: Mountain Run, base of Strickler Knob, ca. 5 mi W Luray, 9 February 1975, O. S. Flint, Jr. (USNM 6). *York Co.*: Yorktown Naval Weapons Station, 4 April 1991, Kurt A. Buhlmann (VMNH 1).

Most of these records are consistent with the known range of this boreal, psychrophilic insect. That for York County is a little more southward and lowland than might have been expected, but Prof. Byers advises (*in litt.*) that he found the species in some numbers on snow in Rock Creek Park, District of Columbia. Presumably, *B. brumalis* occurs in much of Virginia, but pitfall trapping is probably not the optimal technique for collecting this species.

*Boreus nivoriundus* (Fitch). With a range centered on northeastern North America, this species has been documented as far south as the Great Smoky Mountains, but not recorded for Kentucky (Byers & Covell, 1981) or Virginia. VMNH material is from *Augusta Co.*: ca. 5 mi W Stokesville, GWNF, compartment 453-11, 12 December 1988, Barry D. Flamm (VMNH 2); same site but compartment 453-1A, 12 December 1988, Barry D. Flamm (VMNH 2). *Nelson Co.*: "The Priest", 3900 ft., GWNF, ca. 4.5 mi SE Montebello, 20 January-28 February 1992, VMNH survey (VMNH 1).

It is not clear why the Augusta County site should be favored by boreids. The substrate is upper Devonian red shale, with a forest cover of oak, hickory, and pine. Compartments 453-11 and 453-1A (*B. nivoriundus*) are both "old growth" stands which were not logged in the last century like the remainder of the area. Compartment 460-5 (*B. brumalis*), adjacent to 453-11, is currently invested in mature second growth forest, but generalizations cannot be drawn from so few data.

The Virginia localities for *B. nivoriundus* require modification of the maps in Webb et al. (1975) and Penny (1977) to fill most of the central Appalachian lacuna they indicate.

I am pleased to acknowledge the generous assistance, in the form of identifications, locality records, and manuscript review, provided by Professor

George W. Byers and Dr. Oliver S. Flint, Jr.

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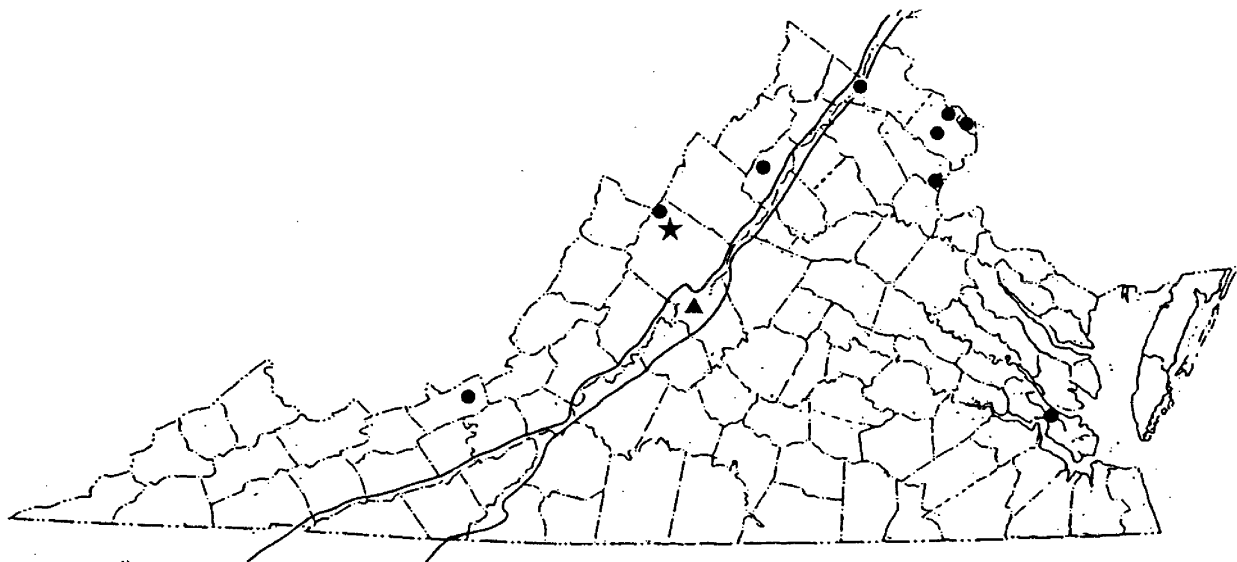


Fig. 1. Virginia localities for *Boreus brumalis* (●), *B. nivoriundus* (▲) and the site at which they are sympatric (★). The extent of the Blue Ridge Physiographic Province is indicated by the two solid lines trending northeast to southwest.

## Miscellanea

## Reports

## 1. President's Report

On May 11-12, 2002 a BioBlitz was conducted at Pocahontas State Park. Many of the members of your Executive Committee would have liked to offer financial support to this endeavor. However, given the current status of our finances we could not justify an expenditure of funds (more on this later). Nevertheless, the Virginia BioBlitz was supported by the participation of a number of VNHS members. Many of these were representing their respective employers but they also represented the contributions of the VNHS and its membership. Endeavors such as this require more than financial support and I am sure the organizers wish to thank each of you for your time as do I.

Our 10<sup>th</sup> Annual Meeting was held at Hampton University, Hampton, Virginia on May 23, 2002. Our meeting was held with the Natural History and Biodiversity Section of the Virginia Academy of Science. This arrangement has greatly benefitted both organizations and has produced a series of successful meetings through the years. Thirteen oral presentations were given along with three posters. Six student presentations were in competition for the VAS William S. Woolcott Best Student Paper Award.

This fall we will need to elect a new Councilor and a President Elect (Vice President). Joella Killian's (Mary Washington College) term as Councilor expires in December and Barbara Abraham (Hampton University) will assume the office of President at the same time. I will be forming a nominating committee to come up with a slate of candidates. I also ask each of you to consider submitting the names of members willing to serve a term as a Councilor or President Elect. First ask the individual if they are willing to serve and then forward their name to me ([wwieland@mw.edu](mailto:wwieland@mw.edu)) or any member of the Executive Committee. There may also be a vote on changing the Bylaws regarding terms of Councilors on the same ballot. Currently there are three Councilors, each serving a 4-year term. The terms of Councilors are staggered to allow for an "institutional memory." These criteria allow for a Councilor election each year with every fourth year having no election. Under this system it is cumbersome to keep track of terms. The Executive Committee is reviewing this and hopes to have a solution soon.

We are half way through 2002 and with this issue the Virginia Natural History Society is publishing issue Number 19 of *Banisteria*. It has been an excellent

source of information on the natural history of Virginia. Our current editors and the previous editor have done an admirable job in producing a high quality publication. Your governing board is, however, concerned about the financial stability of the VNHS. Subscriptions are down and our annual income from this source pays for the publication with little left over. Indeed, income from subscriptions/memberships is our primary means for financing this publication. Given the slow down in the economy we are concerned about our reserves for unexpected expenses. We are working to reduce costs while maintaining the high standard set by past issues of *Banisteria*. In short, we need to increase subscriptions to maintain *Banisteria*. A new VNHS brochure was prepared by councilor Tom McAvoy this spring. The front illustration features scanned covers of two past issues of *Banisteria* and should be more effective in our efforts to recruit new library subscriptions. Copies can be obtained from Anne Lund, Secretary-Treasurer.

In one form or another I have been involved in the scientific community of Virginia ever since I gave my first presentation before the Virginia Academy of Science in 1972. I was absent from Virginia for a short period while attending graduate school. During the past 30 odd years there has been a great proliferation of organizations for the study of natural history within the Commonwealth. Whether you joined one of these because of your profession or your avocation you may be finding yourself stretched thin. More specifically, if you are like me, lately you have found your pocketbook stretched thin. You can no longer justify a membership in so many groups. Unlike the Federal Government, we cannot have deficit spending (at least not for long) in our personal budget. So, you have to make a decision. A difficult decision, because all of these groups are good organizations, but there are just too many. Which memberships will you maintain and which must go? Let me give you several reasons why you should continue your Virginia Natural History Society membership. First, you get a network of like-minded people to share your interests. True, you could develop your own network but through the Society you can quickly come into contact with individuals it might take a lifetime to meet. Second, we hold an Annual Meeting at which members have the opportunity to communicate their work and also hear what others have found. Abstracts from these presentations are published in the Virginia Journal of Science. Further, student presenters at this meeting may compete for a \$100 prize for best paper. Third, you receive a subscription to *Banisteria*.

Whether your area of interest is botany or zoology, ornithology or herpetology, ferns or thistles, or, as most of us, your interests are much broader when it comes to natural history, membership in the VNHS provides many benefits. The VNHS, through *Banisteria*, provides a significant outlet for natural history information on the biota of Virginia. In short, by maintaining a membership in the VNHS you can maintain a conduit to a wide and rich variety of Virginia naturalists. Renew your membership and tell a fellow naturalist!

Respectfully submitted,  
Werner Wieland, President

## 2. Secretary-Treasurer's Report

We have 116 memberships, 14 of which are institutions or libraries. These are both new and renewed memberships for 2002. This is not as high as we would like for this new year, but this is a good total in some ways considering that we have sent no additional reminders so far this year. We will be reminding members to renew their membership with the society by sending them a notice about renewal and a return envelope in our mailing of *Banisteria* (#19), this issue, the first for year 2002. (At the end of 2001, we had 158 members.)

As always, we encourage our active members to recruit members for the Society. A membership form is included with this mailing. Pass it on to a friend or colleague interested in the natural history of our state. If you were a member last year, and have not renewed your membership, you are receiving this journal with a reminder to submit your membership payment.

Our treasury presently holds \$5,281 (as of June 11, 2002). The expenses for the publication and mailing of this issue of *Banisteria* (#19) will be subtracted from this amount. We are always grateful for contributions from Society members above the regular membership amounts, and we have received thirteen such donations during the first half of the year totaling \$175.

An important item to mention in our treasury report is that the Society provided a graduate fellowship of \$500 for a young biologist to work at the Virginia Museum of Natural History in Martinsville, Virginia.

We continue to be grateful to Hampden-Sydney College for support with the paperwork concerning our treasury. The secretary at Gilmer Hall, Hampden-Sydney College, Beckie Smith, has done a great job of keeping our records of membership, and she has prepared the address labels for all mailings. We thank

her for her dedication to these tasks, and we thank the College for supplying this support to the Society.

Please submit all enquiries about membership in the Society or about past issues of *Banisteria* to: Dr. Anne Lund, Virginia Natural History Society, Box 62, Hampden-Sydney, Virginia 23943.

Respectfully submitted,  
Anne Lund, Secretary/Treasurer

## 3. Editors' Report

### Personal Commentary II

I am glad to see that my Personal Commentary in *Banisteria* 18 generated some responses. I want to say at the outset here that I apologize to anyone who took offense. I grew increasingly tired of saying the same old thing in each issue - "We need more manuscripts." This is a common problem with small journals, although the breadth of ours should allow for authors of many disciplines to make plenty of contributions. My commentary was written to analyze why so few manuscripts were submitted and to see if I could wrench out a few from people who had just not taken the time to finish one.

In the context of the commentary, laziness was equated with how one arranges his or her priorities. I have decided a long time ago to put publications high on my list of priorities. Others may value teaching or other professional pursuits somewhat more. I certainly don't believe anyone out there is lazy, as we are all working harder than ever. Maybe I cannot expect others to value publishing one's natural history information or data as much as I do. I simply remain concerned that we are not seeing the number of submissions that will ensure that *Banisteria* will thrive.

I truly believe in the concept of teamwork. Effective team players are leaders when they need to be and followers when they need to be. Team players support the goal of the team. The VNHS team has a primary goal of publishing *Banisteria*. This goal is achieved only if the team players contribute to it. Thus, the success of the team, in this case the success of *Banisteria*, is realized by those members who contribute manuscripts. I wish that all of you were contributing members of this team. Some members contribute in other important ways, such as serving as society officers. However important this service is, the success of our journal is still dependent on contributions from the team.



So, again, I apologize to any reader that had problems with my previous commentary. The rest of you saw though the ruse for what it was, a tactic to generate more manuscripts for *Banisteria* and, admittedly, for venting some frustration over this issue.

Joe Mitchell

The Spring 2002 issue of *Banisteria* (Number 19) will be smaller than many previous issues. This is due entirely to the fact that manuscript submissions have been slow in coming. We have several in the review process that should make the next issue full size. Remember to send vertebrate and biography manuscripts to Joe Mitchell and those on invertebrates and plants to Steve Roble.

Joe Mitchell and Steve Roble, Co-editors

#### 4. Tenth Annual Meeting of the Virginia Natural History Society

The 10<sup>th</sup> annual meeting of the VNHS was held on 23 May 2002 at Hampton University, Hampton, VA. The titles of papers presented at this meeting are listed below:

Microhabitat differences between the ants *Monomorium minimum* and *M. viride* (Formicidae: Myrmicinae) in a longleaf pine forest. H. C. Revis and D. A. Waller.

A demographic analysis of the snail *Leptoxis carinata* in an Appomattox River tributary: movement patterns vary as a function of habitat type. L. M. Brantley, T. R. Edwards, and T. W. Stewart.

Colony distribution of the fungus-growing ant *Trachymyrmex septentrionalis* related to light availability in a longleaf pine habitat. J. P. Howell and D. A. Waller.

Den tree and habitat characteristics of the northern flying squirrel (*Glaucomys sabrinus*) in two different aged stands in the Mt. Rogers NRA. M. Hackett and J. Pagels.

Trends through time: 57 years of spring arrival dates of Neotropical migrant birds in central Virginia. P. Bedell.

Assessment of biological integrity in an agriculturally impacted Virginia mountain stream. J. H. Roberts, T. J. Newcomb, and M. J. Pinder.

Ant catch related to pitfall trap type in a longleaf pine habitat. D. A. Waller.

Life history aspects of the creeper, *Strophitus undulatus*, and green floater, *Lasmigona subviridis* (Bivalvia: Unionidae). R. A. Mair, J. W. Jones, and R. J. Neves.

Using zebrafish survivorship to monitor organic pollutants in sediments of Virginia waters. R. M. Northington and T. W. Stewart.

Effect of prescribed burns on insect diversity in a longleaf pine habitat. C. F. Abadam and D. A. Waller.

Subterranean termite (Isoptera: Rhinotermitidae) response to essential oils. L. K. Baron and D. A. Waller.

Distribution of the endangered Roanoke logperch, *Percina rex*, and species of concern Roanoke bass, *Ambloplites cavifrons*, within the Smith River drainage. T. Smith.

Anuran oviposition site selection: how behavior influences community structure. J. F. Rieger, C. A. Binckley, and W. J. Resetarits, Jr.

The following posters also were presented at the meeting:

An unusual coat color pattern in a short-tailed shrew, *Blarina brevicauda*. G. B. Bumann and P. F. Scanlon.

Habitat use and exploitation of the striped bass and hybrid striped bass in Claytor Lake, Virginia: preliminary findings. J. M. Kilpatrick and J. J. Ney.

Phylogeography of raccoons (*Procyon lotor*) on the Virginia barrier islands: a nested clade analysis of mitochondrial DNA haplotypes. N. D. Moncrief, R. A. Van Den Bussche, and R. D. Dueser.

### Announcements

#### 1. Flora of Virginia Project

For more than half a century, Virginia botanists have attempted to develop a *Flora of Virginia*. Through a coalition of public, academic, and private cooperators, this elusive dream may soon become reality. In 2001, the non-profit organization, The Foundation of the *Flora of Virginia* Project, Inc. was

founded with the ambitious goal of completing an illustrated manual with accompanying illustrated website by the year 2007.

Chris Ludwig, Chief Biologist of the Virginia Division of Natural Heritage, heads the Foundation as Executive Director and Board President. Other Board members include Dr. Donna Ware, former curator of the College of William and Mary herbarium and a coauthor of the *Atlas of the Virginia Flora*; Michael Lipford, Vice President and Virginia Executive Director of The Nature Conservancy; Nicky Staunton, President of the Virginia Native Plant Society; Dr. Chip Morgan, representative of the Wintergreen Nature Foundation; Marion Lobstein, Vice President of the Virginia Academy of Science; Tom Smith, director of the Virginia Division of Natural Heritage, and Mike Garson, the Foundation's attorney. Dr. Rex Baird, chair of the Virginia Academy of Science Flora Committee, is Treasurer.

The *Flora of Virginia* will be written by Alan Weakley, curator of the University of North Carolina Herbarium and Chris Ludwig, who was Botanist with Virginia Natural Heritage. Other contributors and authors will be involved as well. The authors are co-chairs of a 40-member technical advisory board that includes many of Virginia's finest botanists. The advisory board will assist in key decisions on content and format and provide crucial technical assistance to the Project such as field testing keys and descriptions, providing materials for illustrators, and possibly providing portions of the manual and website's text.

This effort requires solid financial backing. Joslin Gallatin, past-president and fundraiser for the Foundation of the State Arboretum, is the Project's fundraiser. The Project has also been bolstered by a sizable donation from the Virginia Division of Natural Heritage. The Project has initiated other fundraising efforts through major grant applications and requests from private individuals. To learn more about the Flora of Virginia Project, visit the project website at [www.dcr.state.va.us/dnh/vaflora.htm](http://www.dcr.state.va.us/dnh/vaflora.htm).

### Instructions for Contributors

*Banisteria* accepts manuscripts that contribute to the public and scientific knowledge of the natural history of Virginia. This publication is intended to be an outlet for the kind of information that is useful but would not be accepted in the mainstream journals. Information found in field notebooks and files that never made it into scientific journals is especially important. Manuscripts derived from natural history observations, small-scale

field projects, distribution surveys and reviews, species inventories, reports for contracted environmental projects, and unpublished theses are especially desired. The focus of *Banisteria* is classical and therefore slanted toward organismal biology. Reviews of books relevant to Virginia's natural history and biographies of naturalists influential in this field are also welcomed by the editors. The journal also is suited for papers on the history of natural history as it pertains to Virginia.

To qualify for publication in *Banisteria*, the manuscript must pertain in some way to the flora, fauna, geology, geography or Native Americans of the Commonwealth. Papers focusing largely on projects conducted outside of the state will be considered only if there is a strong connection to Virginia. Papers may be full length or shorter contributions, and we are always looking for book reviews. Authors are not required to be members of the Virginia Natural History Society to submit manuscripts, although membership in VNHS is strongly encouraged. There are no page charges for members. The editors will be happy to assist authors in their preparation of manuscripts. We would rather help get natural history information published for others to use than have it remain on the shelf or in someone's desk.

Manuscripts on vertebrates, history, biography, and material for the Miscellanea section (book reviews, announcements, news of members, obituaries, etc.) should be sent to Joe Mitchell. Manuscripts on plants and invertebrates should be sent to Steve Roble. Papers on other topics can be submitted to either editor. Mitchell and Roble will serve as editors for each other's papers and an associate editor will be asked to serve as editor for those papers written jointly by the co-editors.

Manuscripts should be sent in duplicate to the appropriate co-editor (see previous paragraph), who will in turn seek one or two reviews. Authors should retain both the original typescript and figures until final acceptance for publication. Photocopies are adequate for review purposes.

Manuscripts must be written on one side of standard size paper (21.5 x 28 cm) using double spacing throughout. Words should not be hyphenated. Manuscripts should be arranged in the following order: **title, author's name, author's address, text, acknowledgments, literature cited, tables, figure legends, figures.** Long manuscripts should have standard sections, e.g., Materials and Methods, Results, and Discussion, although some papers may not be amenable to such division, and short manuscripts (<4-6 pages) need not have these sections. All pages should be numbered, including tables. The title should be concise but informative. It and the author's name and

address should be centered at the top of the first page. The text should begin on the first page beneath the author's address. Use good judgment on arrangement of sections when other than the standard approach is necessary. Use italics or underlines for species' scientific names.

**References:** Use the following as a guide. **Do not abbreviate journal names.**

*Journal article with 1 author:*

Scott, D. 1986. Notes on the eastern hognose snake, *Heterodon platyrhinos* Latreille (Squamata: Colubridae), in a Virginia barrier island. *Brimleyana* 12: 51-55.

*Journal article with 2 authors:*

Tilley, S. C., & D. W. Tinkle. 1968. A reinterpretation of the reproductive cycle and demography of the salamander *Desmognathus ochrophaeus*. *Copeia* 1968: 299-303.

*Journal article with 3+ authors:*

Funderburg, J. B., P. Hertz, & W. M. Kerfoot. 1974. A range extension for the carpenter frog, *Rana virgatipes* Cope, in the Chesapeake Bay region. *Bulletin of the Maryland Herpetological Society* 10: 77-79.

*Book:*

Harris, L. D. 1984. *The Fragmented Forest*. University of Chicago Press, Chicago, IL. 211 pp.

*Chapter in a book:*

Gentry, A. H. 1986. Endemism in tropical versus temperate plant communities. Pp. 153-181 *In* M. Soule (ed.), *Conservation Biology*. Sinauer Associates, Inc., Sunderland, MA.

*Report:*

The Nature Conservancy. 1975. *The preservation of natural diversity: A survey and recommendations*. Report to the U.S. Department of Interior, Washington, DC. 189 pp. (include report series and number if present).

*Thesis:*

Riddick, M. B. 1973. *Freshwater mussels of the Pamunkey River system, Virginia*. Master's Thesis, Virginia Commonwealth University, Richmond, VA. 105 pp.

**Tables:** Each table should be typed on a separate sheet of paper, preferably using 10 point font. A legend for

each table should follow the number and must be on the same page as the table. Ruled, horizontal lines should be avoided except at the top and bottom of the table. Remember that **each table must fit within a space of 6.5 x 8.5 inches**, and that reduction may cause loss of detail.

**Figures:** Black and white line drawings are acceptable for publication. They should be no more than twice the size of final publication size, and if several are assembled as a plate, keep the ratio of height to width consistent with the rectangular shape of the page. The back of each figure should be labeled with the author's name.

**Photographs:** *Banisteria* will accept high contrast black and white photographs. Submit at least 5 x 7 inch (12.5 x 17.5 cm) photos and mount them if possible. Remember that reduction to fit column or page width will cause loss of detail.

**Abbreviations:** The following common abbreviations are accepted in *Banisteria*: n (sample size), no. (number), SVL (snout-vent length; define on first usage), DBH (diameter at breast height), yr (years), mo (months), wk (weeks), h (hours), min (minutes), s (seconds), P (probability), df (degrees of freedom), SD and SE (standard deviation and standard error), ns (not significant), l (liter), g (gram), mm (millimeter), m (meter), km (kilometer), and C (degrees Celsius). Do not abbreviate "male" and "female", or dates, or undefined terms.

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